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(505) 827–3824 Fax: (505) 827–3888

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Grand Forks, ND 58202–9000
(701) 777–4632 Fax: (701) 777–3319

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Columbus, OH 43215–4163
(614) 644–7051 Fax: (614) 752–9178

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(803) 656–5174 Fax: (803) 656–3025

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Columbia, SC 29208
(803) 777–4841 Fax: (803) 777–9503

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Merrill Library Documents Dept.
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(801) 797–2678 Fax: (801) 797–2677

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(206) 753–4027 Fax: (206) 586–7575

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
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8. Abstract Author
9. Subject Terms

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 36, OCTOBER 26, 1998

01
AERONAUTICS (GENERAL)

19980219349 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography, Supplement 383
Sep. 18, 1998; 49p; In English
Report No.(s): NASA/SP-1998-7037/SUPPL383; NAS 1.21:7037/SUPPL383; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This bibliography lists reports, articles and other documents announced in the NASA science and technical information system. Subject coverage includes: Design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics.
CASI
Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

19980219350 NASA Langley Research Center, Hampton,VA USA
Aeronautical Engineering: A Continuing Bibliography, Supplement 384
Oct. 02, 1998; 38p; In English
Report No.(s): NASA/SP-1998-7037/SUPPL384; NAS 1.21:7037/SUPPL384; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This bibliography lists reports, articles and other documents announced in the NASA science and technical information system. Subject coverage includes: Design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics.
CASI
Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19980220443 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Performance Comparison Between Two Airfoils for Wind Turbine Blade
Suido, Goichi, Ibaraki Univ., Japan; Kato, Eizi, Ibaraki Univ., Japan; Tachikawa, Tsutomu, Ibaraki Univ., Japan; Matsumiya, Hikaru, Ministry of International Trade and Industry, Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 197-204; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The present work is an attempt to examine the characteristics of two airfoils (MEL-IBA-001, FX-84W140) and to discuss the performance for the wind turbine blades. MEL-IBA-001 (MEL) was designed for a wind turbine blade, and FX-84Wl4O (FX) has been used for the blade. The maximums of the camber of MEL and FX and the maximum thickness of both airfoils were situated respectively at 0.47, 0.41, and 0.36 the chord length from the leading edges. Wind tunnel tests for the airfoil characteristics was performed at the Reynolds numbers 0.7 x 10(exp 5) and 3.5 x 10(exp 5), in the range of the angle of attack, -24 deg. to 24

deg. respectively. The results indicate that no appreciable difference was observed in the lift/drag ratio between the airfoils, but MEL was better than FX in the lift characteristics, MEL was therefore preferable to FX for a wind turbine blade.
Author
Wind Tunnel Tests; Wind Turbines; Airfoils; Performance Tests; Turbine Blades; Aerodynamic Characteristics

19980221240 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Hungary 97 Military Real-Time Simulation
Csarnoy, P., European Organization for the Safety of Air Navigation, France; Feb. 1998; 66p; In English
Report No.(s): PB98-164361; EEC-325; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes a real-time simulation study which was conducted using Hungarian airspace. The aim of the simulation was to further evaluate the Civil-Military co-operation with the Flexible Use Airspace Concept, improvements to the simulated MATIAS functionalities, and to provide a training program for the military controllers.
NTIS
Air Traffic Control; Airspace; Controllers; Military Operations; Computerized Simulation

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19980221125 Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Washington, DC USA
Profile of the Air Transportation Industry: EPA Office of Compliance Sector Notebook Project
Feb. 1998; 106p; In English
Report No.(s): PB98-158686; EPA/310/R-97/001; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The air transportation sector can be broken down into two categories: (1) facilities providing scheduled, non-scheduled, and air courier services using aircraft, and (2) airports and airport operations. It is these two major topics (i.e., aircraft facilities and airports) and the activities and operations that occur within each of these areas that are the primary focus of this notebook.
NTIS
Air Transportation; Airports; Industries; Pollution Control; Civil Aviation

19980221239 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Comparative Experiments with Speech Recognizers for ATC Simulations
Hering, H., European Organization for the Safety of Air Navigation, France; Mar. 1998; 34p; In English
Report No.(s): PB98-164346; EEC/NOTE-9/98; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Innovative multimedia techniques like speech recognition are in development and could be used for realtime ATC simulation facilities. The specific ATC command language, with its restrictive structure, may be more applicable to speech recognition systems. Industry is offering speech recognition devices based upon different concepts and very high recognition quality is reported. The aim of the experiments reported upon was to examine the recognizers under conditions as closely as possible to real-time ACT simulations. For this reason, speech recordings were conducted during live EEC real-time simulations manned by experimented controllers of different nationalities and diverse native languages.
NTIS
Air Traffic Control; Real Time Operation; Speech Recognition; Command Languages

19980221241 European Organization for the Safety of Air Navigation, Bretigny-sur-Orge, France
Distributed and Fault Tolerant Flight Data Management (DIFODAM)
Florent, J. P., European Organization for the Safety of Air Navigation, France; Barabas, F., European Organization for the Safety of Air Navigation, France; Poddany, A., European Organization for the Safety of Air Navigation, France; Feb. 1998; 34p; In Mixed
Report No.(s): PB98-164379; EEC-326; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

DIFODAM introduces the concept of Shared Flight Plans. Traditional implementations of shared data rely on a central database management system which guarantees data consistency. We propose an alternative solution based on Group Communication

which provides a simple, common service for sharing Flight Plan Data in a synchronous multi-server context. We describe the design of the architecture with emphasis on flexibility.
NTIS
Fault Tolerance; Flight Plans; Flight Management Systems; Data Management; Data Base Management Systems; Air Traffic Control; Distributed Processing

19980221251 Federal Aviation Administration, Fire Safety Section, Atlantic City, NJ USA
Initial Development of an Exploding Aerosol Can Simulator
Marker, Timothy, Federal Aviation Administration, USA; Apr. 1998; 20p; In English
Report No.(s): PB98-157977; DOT/FAA/AR-TN97/103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A device was constructed to simulate an exploding aerosol can. The device consisted of a cylindrical pressure vessel for storage of flammable propellants and base product and a high-rate discharge (HRD) valve for quick release of the constituents. Simulator tests were conducted using representative constituents and propellant quantities for comparison with actual cans heated to the point of rupture and ignition. This report describes the tests conducted with the simulator in unconfined spaces, a B-727 cargo compartment, and an LD-3 Unit Loading Device (ULD). Subsequent work is planned with the aim of matching the pressure pulse produced by the exposing aerosol can simulator with that measured during an overheated aerosol can explosion.
NTIS
Aerosols; Simulators; Cans; Explosions

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19980220116 NASA Langley Research Center, Hampton, VA USA
An Aerodynamic Assessment of Micro-Drag Generators (MDGs)
Bauer, Steven X. S., NASA Langley Research Center, USA; 1998; 11p; In English; 20th; Applied Aerodynamics, 15-18 Jul. 1998, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 98-2621; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Commercial transports as well as fighter aircraft of the future are being designed with very low drag (friction and pressure). Concurrently, commuter airports are being built or envisioned to be built in the centers of metropolitan areas where shorter runways and/or reduced noise footprints on takeoff and landing are required. These requirements and the fact that drag is lower on new vehicles than on older aircraft have resulted in vehicles that require a large amount of braking force (from landing-gear brakes, spoilers, high-lift flaps, thrust reversers, etc.). Micro-drag generators (MDG;s) were envisioned to create a uniformly distributed drag force along a vehicle by forcing the flow to separate on the aft-facing surface of a series of deployable devices, thus, generating drag. The devices are intended to work at any speed and for any type of vehicle (aircraft, ground vehicles, sea-faring vehicles). MDGs were applied to a general aviation wing and a representative fuselage shape and tested in two subsonic wind tunnels. The results showed increases in drag of 2 to 6 times that of a ”clean” configuration.
Author
Aerodynamic Drag; Braking; Fighter Aircraft; Flapping; Friction; Landing Gear

19980221238 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Revision Summary Document for the Base Aircraft Data (BADA)
Bos, A., European Organization for the Safety of Air Navigation, France; Mar. 1998; 56p; In English
Report No.(s): PB98-164338; EEC/NOTE-7/98-Rev-3.0; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This Revision Summary document (RSD) describes all changes made to BADA files in Revision 3.0 since the two previous releases, Revision 2.5 and 2.6. Configuration management procedures for BADA trace all changes through Configuration Change Orders (CCOs). The RSD thus presents a list of all 33 CCOs implemented for BADA 3.0 along with a description for each CCO.
NTIS
Configuration Management; Management Methods; Aircraft Structures; Data Bases

19980221252 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Aircraft Performance Summary Tables for the Base of Aircraft Data (BADA), Revision 3.0, *Jan. 1997 - Mar. 1998*
Bos, A., European Organization for the Safety of Air Navigation, France; Mar. 1998; 92p; In English
Report No.(s): PB98-164395; EEC/NOTE-10/98; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A set of aircraft performance summary tables are presented for the 67 aircraft types modeled by the Base of Aircraft Data (BADA) Revision 3.0. For each aircraft type, the performance tables specify the true air speed, rate of climb/descent and fuel flow for conditions of climb, and descent at various flight levels. The performance figures contained within the tables are calculated based on a total-energy model and BADA 3.0 performance coefficients.
NTIS
Aircraft Performance; Aircraft Models; Equivalence; Data Bases; Total Energy Systems

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

19980045370 Iowa State Univ. of Science and Technology, Ames, IA USA
Study of a Wake Recovery Mechanism in a High-Speed Axial Compressor Stage *Final Report*
VanZante, Dale E., Iowa State Univ. of Science and Technology, USA; Feb. 1998; 160p; In English
Contract(s)/Grant(s): NAG3-1302; RTOP 523-26-33
Report No.(s): NASA/CR-1998-206594; E-11045; NAS 1.26:206594; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This work addresses the significant differences in compressor rotor wake mixing loss which exist in a stage environment relative to a rotor in isolation. The wake decay for a rotor in isolation is due solely to viscous dissipation which is an irreversible process and thus leads to a loss in both total pressure and efficiency. Rotor wake decay in the stage environment is due to both viscous mixing and the inviscid strain imposed on the wake fluid particles by the stator velocity field. This straining process, referred to by Smith (1993) as recovery, is reversible and for a 2D rotor wake leads to an inviscid reduction of the velocity deficit of the wake. A model for the rotor wake decay process is developed and used to quantify the viscous dissipation effects relative to those of inviscid wake stretching. The model is verified using laser anemometer measurements acquired in the wake of a transonic rotor operated in isolation and in a stage configuration at near peak efficiency and near stall operating conditions. Additional insight is provided by a time-accurate 3D Navier-Stokes simulation of the compressor stator flow field at the corresponding stage loading levels. Results from the wake decay model exhibit good agreement with the experimental data. Data from the model, laser anemometer measurements, and numerical simulations indicate that for the rotor/stator spacing used in this work, which is typical of core compressors, rotor wake straining (stretching) is the primary decay process in the stator passage with viscous mixing playing only a minor role. The implications of these results on compressor stage design are discussed.
Author
Turbocompressors; Compressor Rotors; Wakes; Mathematical Models

19980219005 General Electric Co., Aircraft Engines, Cincinnati, OH USA
Optical Closed-Loop Propulsion Control System Development *Final Report*
Poppel, Gary L., General Electric Co., USA; Aug. 1998; 80p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-26617; RTOP 519-30-53
Report No.(s): NASA/CR-1998-208416; E-11272; NAS 1.26:208416; R98AEB237; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The overall objective of this program was to design and fabricate the components required for optical closed-loop control of a F404-400 turbofan engine, by building on the experience of the NASA Fiber Optic Control System Integration (FOCSI) program. Evaluating the performance of fiber optic technology at the component and system levels will result in helping to validate its use on aircraft engines. This report includes descriptions of three test plans. The EOI Acceptance Test is designed to demonstrate satisfactory functionality of the EOI, primarily fail-safe throughput of the F404 sensor signals in the normal mode, and validation, switching, and output of the five analog sensor signals as generated from validated optical sensor inputs, in the optical mode. The EOI System Test is designed to demonstrate acceptable F404 ECU functionality as interfaced with the EOI, making use of a production ECU test stand. The Optical Control Engine Test Request describes planned hardware installation, optical

signal calibrations, data system coordination, test procedures, and data signal comparisons for an engine test demonstration of the optical closed-loop control.
Author
Optical Measuring Instruments; Control Systems Design; Fabrication; Feedback Control; Acceptability

19980219339 NASA Lewis Research Center, Cleveland, OH USA
Energy Efficient Engine Low Pressure Subsystem Aerodynamic Analysis
Hall, Edward J., Allison Engine Co., USA; Delaney, Robert A., Allison Engine Co., USA; Lynn, Sean R., Allison Engine Co., USA; Veres, Joseph P., NASA Lewis Research Center, USA; Jul. 1998; 18p; In English; 34th; Propulsion, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-27394; RTOP 509-10-11
Report No.(s): NASA/TM-1998-208402; E-11234; NAS 1.15:208402; AIAA Paper 98-3119; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this study was to demonstrate the capability to analyze the aerodynamic performance of the complete low pressure subsystem (LPS) of the Energy Efficient Engine (EEE). Detailed analyses were performed using three- dimensional Navier-Stokes numerical models employing advanced clustered processor computing platforms. The analysis evaluates the impact of steady aerodynamic interaction effects between the components of the LPS at design and off- design operating conditions. Mechanical coupling is provided by adjusting the rotational speed of common shaft-mounted components until a power balance is achieved. The Navier-Stokes modeling of the complete low pressure subsystem provides critical knowledge of component acro/mechanical interactions that previously were unknown to the designer until after hardware testing.
Author
Aerodynamic Characteristics; Low Pressure; Mathematical Models

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 05 Aircraft Design, Testing and Performance.

19980221026 NASA Langley Research Center, Hampton, VA USA
Study of a Simulation Tool to Determine Achievable Control Dynamics and Control Power Requirements with Perfect Tracking
Ostroff, Aaron J., NASA Langley Research Center, USA; Aug. 1998; 30p; In English
Contract(s)/Grant(s): RTOP 522-21-61-01
Report No.(s): NASA/TM-1998-208699; L-17767; NAS 1.15:208699; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper contains a study of two methods for use in a generic nonlinear simulation tool that could be used to determine achievable control dynamics and control power requirements while performing perfect tracking maneuvers over the entire flight envelope. The two methods are NDI (nonlinear dynamic inversion) and the SOFFT(Stochastic Optimal Feedforward and Feedback Technology) feedforward control structure. Equivalent discrete and continuous SOFFT feedforward controllers have been developed. These equivalent forms clearly show that the closed-loop plant model loop is a plant inversion and is the same as the NDI formulation. The main difference is that the NDI formulation has a closed-loop controller structure whereas SOFFT uses an open-loop command model. Continuous, discrete, and hybrid controller structures have been developed and integrated into the formulation. Linear simulation results show that seven different configurations all give essentially the same response, with the NDI hybrid being slightly different. The SOFFT controller gave better tracking performance compared to the NDI controller when a nonlinear saturation element was added. Future plans include evaluation using a nonlinear simulation.
Author
Control Systems Design; Dynamic Control; Feedback Control; Feedforward Control

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).

19980221024 Science Applications International Corp., Air Transportation Systems Operations, Arlington, VA USA
Evaluation of a Heliport Lighting Design during Operation Heli-STAR ***Final Report***
Fontaine, Scott A., Science Applications International Corp., USA; Jun. 1998; 32p; In English
Contract(s)/Grant(s): DTFA01-93-C-00030
Report No.(s): PB98-155401; DOT/FAA/ND-97/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The FAA is evaluating the lighting requirements for support of differential GPS approaches to heliports. Previous lighting systems developed by the FAA to support instrument approaches to heliports are the Heliport Instrument Lighting System (HILS) and the Heliport Approach Lighting System (HALS). As a part of the requirements evaluation, a prototype lighting system was developed and tested by the University of Tennessee Space Institute. After a limited evaluation in Tennessee, the FAA conducted further evaluation as part of Operation Heli-STAR, a demonstration helicopter transportation system established in Atlanta, GA during the 1996 Olympic Games. The prototype system used a 20-foot light pipe, green cold-cathode lights, and electroluminescent panels. A semipermanent installation was built, improvements were made, and many parameters were identified for further evaluation in simulation and flight testing. The lighting system has been moved to Washington, DC for further evaluation.
NTIS
Heliports; Flight Tests; Runway Lights; Landing Sites; Illuminating

12
ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19980219385 NASA Marshall Space Flight Center, Huntsville, AL USA
The Human Mars Mission: Transportation Assessment
Kos, Larry, NASA Marshall Space Flight Center, USA; 1998; 6p; In English; Space Technology and Applications, 25-29 Jan. 1998, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

If funding is available, and for NASA planning purposes, the Human Mars Mission (HMM) is baselined to take place during the 2011 and 2013/2014 Mars opportunities. Two cargo flights will leave for Mars during the first opportunity, one to Mars orbit and the second to the surface, in preparation for the crew during the following opportunity. Each trans-Mars injection (TMI) stack will consist of a cargo / payload portion (currently coming in at between 65 and 78 mt) and a nuclear thermal propulsion (NTP) stage (currently coming in at between 69 and 77 mt loaded with propellant) for performing the departure (Delta)Vs to get on to the appropriate Mars trajectories. Three 66,700 N thrust NTP engines comprise the TMI stage for each stack and perform a (Delta)V ringing from 3580 to 3890 m/s is required by the trajectory (with gravity losses and various performance margins to this for the total TMI (Delta)V performed). This paper will discuss the current application of this NTP stage to a Human Mars mission, and project what implications a nuclear trans-Earth injection (TEI) stage as well as a bi-modal NTP stage could mean to a human visit to Mars.
Author
Mars (Manned Reusable Spacecraft); Transportation; Payloads; Gravitation

16
SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. for related information see also 03 Air Transportation and Safety and 18 Spacecraft Design, Testing and Performance. For space suits see 54 Man/System Technology and Life Support

19980219027 NASA Johnson Space Center, Houston, TX USA
STS-90 Day 11 Highlights
Apr. 23, 1998; In English; Videotape: 19 min. 19 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-1998372739; BRF-1414K; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this eleventh day of the STS-90 mission, the flight crew, Cmdr. Richard A. Searfoss, Pilot Scott D. Altman, and Mission Specialists Richard M. Linnehan, Dafydd Rhys Williams and Kathryn P. Hire, and Payload Specialists Jay C. Buckey and James A. Pawelczyk once again take part in an experiment aimed at exploring the influence of gravity on blood pressure. The lower body negative pressure test places a stress on the cardiovascular system similar to that experienced when standing in Earth's gravity. Pawelczyk also takes part in the Valsalva test, which stimulates the pressure receptors in the neck and chest and measures those responses. Both Buckey and Pawelzyk participate as subjects and as operators in tests of the autonomic nervous system. All four science crew members conduct tests of their pulmonary systems as well as additional runs in a rotating chair to measure the response of their eyes and inner ears in maintaining balance in a weightless environment.
CASI
Space Transportation System Flights; Space Transportation System; Lower Body Negative Pressure; Gravitational Effects; Payload Delivery (STS); Space Shuttle Missions; Space Shuttle Orbiters; Space Shuttle Payloads

19980219028 NASA Johnson Space Center, Houston, TX USA
STS-90 Day 06 Highlights
Apr. 19, 1998; In English; Videotape: 27 min. 42 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-1998372737; BRF-1414F; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this sixth day of the STS-90 mission, the flight crew, Cmdr. Richard A. Searfoss, Pilot Scott D. Altman, and Mission Specialists Richard M. Linnehan, Dafydd Rhys Williams and Kathryn P. Hire, and Payload Specialists Jay C. Buckey and James A. Pawelczyk are back on the job full-time as they begin the day six of on-orbit research on the human nervous system. Additional work with the Pulmonary Function Test (PFT) equipment which is collecting data on the crew's breathing patterns and blood concentrations of oxygen and carbon dioxide also takes place.
CASI
Space Transportation System; Space Transportation System Flights; Space Exploration; Space Flight; Payload Delivery (STS); Space Shuttle Payloads; Space Shuttle Orbiters

19980219029 NASA Johnson Space Center, Houston, TX USA
STS-90 Day 05 Highlights
Apr. 14, 1998; In English; Videotape: 21 min. 41 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-1998372736; BRF-1414E; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this fifth day of the STS-90 mission, the flight crew, Cmdr. Richard A. Searfoss, Pilot Scott D. Altman, and Mission Specialists Richard M. Linnehan, Dafydd Rhys Williams and Kathryn P. Hire, and Payload Specialists Jay C. Buckey and James A. Pawelczyk perform tests associated with the STS-90 Neurolab Vestibular Team's efforts to gain insight into the balance organs in the ear and all the connections that system has to the eyes, brain, and muscles in adapting to the weightless condition in space and then readapts to the gravity environment found on Earth.
CASI
Space Transportation System; Space Transportation System Flights; Space Shuttle Orbiters; Space Shuttle Payloads; Space Shuttles; Payload Delivery (STS)

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

19980219470 NASA Marshall Space Flight Center, Huntsville, AL USA
An Assessment of the Technology of Automated Rendezvous and Capture in Space
Polites, M. E., NASA Marshall Space Flight Center, USA; Jul. 1998; 54p; In English
Report No.(s): NASA/TP-1998-208528; M-877; NAS 1.60:208528; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper presents the results of a study to assess the technology of automated rendezvous and capture (AR&C) in space. The outline of the paper is as follows. First, the history of manual and automated rendezvous and capture and rendezvous and dock is presented. Next, the need for AR&C in space is established. Then, today's technology and ongoing technology efforts related

to AR&C in space are reviewed. In light of these, AR&C systems are proposed that meet NASA's future needs, but can be developed in a reasonable amount of time with a reasonable amount of money. Technology plans for developing these systems are presented; cost and schedule are included.
Author
Automated Transfer Vehicle; Technology Assessment; Capture Effect; Rendezvous

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.

19980219467 NASA Marshall Space Flight Center, Huntsville, AL USA
On-Orbit Model Refinement for Controller Redesign
Whorton, Mark S., NASA Marshall Space Flight Center, USA; Calise, Anthony J., Georgia Inst. of Tech., USA; 1998; 12p; In English; Aerospace Conference, 21-28 Mar. 1998, Snowmass, CO, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): CDDF Proj. 96-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High performance control design for a flexible space structure is challenging since high fidelity plant models are difficult to obtain a priori. Uncertainty in the control design models typically require a very robust, low performance control design which must be tuned on-orbit to achieve the required performance. A new procedure for refining a multivariable open loop plant model based on closed-loop response data is presented. Using a minimal representation of the state space dynamics, a least squares prediction error method is employed to estimate the plant parameters. This control-relevant system identification procedure stresses the joint nature of the system identification and control design problem by seeking to obtain a model that minimizes the difference between the predicted and actual closed-loop performance. This paper presents an algorithm for iterative closed-loop system identification and controller redesign along with illustrative examples.
Author
Design Analysis; Spacecraft Structures; Feedback Control; Models; Algorithms

19
SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

19980218985 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Nature of Comet Materials and Attachment to Them
Stephens, James, Jet Propulsion Lab., California Inst. of Tech., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 333-340; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Because cometary surfaces are likely to be far colder and of a different composition and surface topography than other planetary surfaces with which we have experience, there are some new considerations that must be examined in regards to placing and attaching instrumented packages or sample return devices in or on their surfaces. The qualitative analysis of the problem of embedding hardware in a comet icy core is limited to only one of several means for the purposes of this discussion. This means can be characterized as a kinetic impact piercing device. Such kinetic impact piercing device may be used to attach the feet of an instrumented package on the surface or it may be the means for implanting the package in the icy core below the mantle. The functional requirement is to implant a device in the icy core and by mechanical means, prevent the device from being ejected back into space. Derived from text
Comets; Qualitative Analysis; Measuring Instruments; Ice; Galactic Structure

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

19980219320 NASA Lewis Research Center, Cleveland, OH USA

Performance of the Spacecraft Propulsion Research Facility During Altitude Firing Tests of the Delta 3 Upper Stage

Meyer, Michael L., NASA Lewis Research Center, USA; Dickens, Kevin W., Sierra Lobo, Inc., USA; Skaff, Tony F., Sierra Lobo, Inc., USA; Cmar, Mark D., Sierra Lobo, Inc., USA; VanMeter, Matthew J., Sierra Lobo, Inc., USA; Haberbusch, Mark S., Sierra Lobo, Inc., USA; Jul. 1998; 20p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 565-02-0D

Report No.(s): NASA/TM-1998-208477; E-11247; NAS 1.15:208477; AIAA Paper 98-4010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Spacecraft Propulsion Research Facility at the NASA Lewis Research Center's Plum Brook Station was reactivated in order to conduct flight simulation ground tests of the Delta 3 cryogenic upper stage. The tests were a cooperative effort between The Boeing Company, Pratt and Whitney, and NASA. They included demonstration of tanking and detanking of liquid hydrogen, liquid oxygen and helium pressurant gas as well as 12 engine firings simulating first, second, and third burns at altitude conditions. A key to the success of these tests was the performance of the primary facility systems and their interfaces with the vehicle. These systems included the structural support of the vehicle, propellant supplies, data acquisition, facility control systems, and the altitude exhaust system. While the facility connections to the vehicle umbilical panel simulated the performance of the launch pad systems, additional purge and electrical connections were also required which were unique to ground testing of the vehicle. The altitude exhaust system permitted an approximate simulation of the boost-phase pressure profile by rapidly pumping the test chamber from 13 psia to 0.5 psia as well as maintaining altitude conditions during extended steady-state firings. The performance of the steam driven ejector exhaust system has been correlated with variations in cooling water temperature during these tests. This correlation and comparisons to limited data available from Centaur tests conducted in the facility from 1969-1971 provided insight into optimizing the operation of the exhaust system for future tests. Overall, the facility proved to be robust and flexible for vehicle space simulation engine firings and enabled all test objectives to be successfully completed within the planned schedule.
Author

Delta Launch Vehicle; Spacecraft Propulsion; Test Firing; Liquid Oxygen; Liquid Hydrogen; Flight Simulation; Rl-10 Engines; Data Acquisition

19980219369 Allied-Signal Technical Services Corp., Las Cruces, NM USA

Feasibility Investigation for Performing Fireball Temperature Tests

Tapphorn, Ralph M., Allied-Signal Technical Services Corp., USA; Kurtz, Joe, Allied-Signal Technical Services Corp., USA; Mar. 11, 1997; 85p; In English

Report No.(s): TR-757-001; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

NASA Johnson Space Center White Sands Test Facility (WSTF) was requested by the Launch Abort Subpanel and the Power Systems Subpanel of the Interagency Nuclear Safety Review Panel to investigate the feasibility of using spectroscopic techniques to measure propellant fireball gas temperatures. This report outlines the modeling and experimental approaches and results of this investigation. Descriptions of the theoretical particle temperature and mass effusion models are presented along with the results of the survivability of small plutonium dioxide (less than or equal to 1000 microns diameter) particles entrained in various propellant fireball scenarios. The experimental test systems used to measure the hydroxide radical, water, and particle graybody spectral emissions and absorptions are discussed. Spectral results along with temperatures extracted by analyzing the spectral features are presented for the flames investigated in the laboratory environment. Methods of implementing spectroscopic measurements for future testing using the WSTF Large-scale Hydrogen/Oxygen Explosion Facility are discussed, and the accuracy expected for these measurements is estimated from laboratory measurements.
Author

Feasibility Analysis; Gas Temperature; Temperature Measurement; Experiment Design; Models

23
CHEMISTRY AND MATERIALS (GENERAL)

19980218964 Osaka City Univ., Dept. of Bioapplied Chemistry, Japan
Catalytic effects of aminated-beta-cyclodextrin derivatives for the decarboxylation of oxalacetate
Azuma, Hideki, Osaka City Univ., Japan; Ogino, Kenji, Osaka City Univ., Japan; Tagaki, Waichiro, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 193-198; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

As a decarboxylase model, the beta-cyclodextrin derivative (CD-1) with one primary amino and six methylamino groups was prepared and the catalytic activity for the decarboxylation of oxalacetate (OA) was examined at pH 4.0-7.0, 25 C. It was found that CD-1 had higher reactivity than CD-2 (CD with mono primary amino group) and CD-3 (CD with seven methylamino groups), and the reactivity of CD-1 was equal to about one-seventh-fold that of PACD (CD with seven primary amino groups). It was thought that the decarboxylation of OA by primary amine catalyst was proceeded via Schiff base intermadiates, and during the reaction it was enable to enhance the catalytic reactivity having secondary amino groups, close to primary amino group, which could be expected to work as coeffective functions.
Author
Carbonyl Compounds; Catalytic Activity; Decarboxylation; Reaction Kinetics; Catalysts; Amino Acids

19980221232 Naval Research Lab., Optical Physics Branch, Washington, DC USA
A Bibliography of Matrix Isolation Spectroscopy: 1985-1997 ***Final Report***
Ochsner, Daryl W., Naval Research Lab., USA; Ball, David W., Naval Research Lab., USA; Kafafi, Zakya H., Naval Research Lab., USA; Jul. 31, 1998; 236p; In English
Report No.(s): PB98-145352; NRL/PU/5610-98-357; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This volume covers the same type of references published in the earlier volume with an intentional overlap for 1985 publications. In addition to references received directly from the authors, computer searches in Chemical Abstracts were also used to collect references. The articles are listed chronologically. Each one has a unique index number in which the first two digits represent the year of publication.
NTIS
Bibliographies; Isolation; Spectroscopic Analysis

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19980218949 Osaka City Univ., Dept. of Mechanical Engineering, Japan
Improvement of damping property of CFRP composite beam interleaved with shape memory polymer using CFRP laminate as a heater
Oshima, Nobuo, Osaka City Univ., Japan; Inui, Daisuke, Osaka City Univ., Japan; Fukuda, Takehito, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 1-6; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

In the present paper, the damping properties of a carbon fiber reinforced plastic (CFRP) and glass fiber reinforced plastic (GFRP) hybrid composite laminate are controlled by CFRP laminate itself as a heater in order to construct so-called smart structures. An shape memory polymer (SMP) film is interleaved between the CF/GF hybrid laminate as a damping material and heated at the desirable temperature. From the preliminary experiments, it is found that the heating capability of the CFRP laminate heater is enough to control the temperature of the composite specimen. It is also verified that the surface temperature is almost uniformly distributed in overall specimen. The damping properties of the composite beam including SMP are analyzed by the Ross-Kerwin-Unger analysis.
Author
Carbon Fiber Reinforced Plastics; Glass Fiber Reinforced Plastics; Beams (Supports); Heating; Hybrid Composites; Laminates; Smart Structures; Vibration Damping; Structural Vibration; Vibration Tests

19980219307 California Inst. of Tech., Graduate Aeronautical Labs., Pasadena, CA USA

Failure of Laminated Composites at Thickness Discontinuities Under Complex Loading and Elevated Temperatures

Lee, S., California Inst. of Tech., USA; Knauss, W. G., California Inst. of Tech., USA; [1998]; 29p; In English

Contract(s)/Grant(s): NsG-1483; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Failure initiation of laminated composites with discontinuous thickness has been studied in terms of typical structural load description (tension, shear force and bending moment) rather than in terms of micromechanics considerations. Four types of specimens of different stacking sequence were examined to determine failure initiation, analyzed subsequently via a finite element analysis (ABAQUS). Depending on the stacking sequence across the interface of the step two different failure modes are identified: For unidirectional fiber orientation across the interface in the tension direction failure occurs through cracking and delamination which is governed by a fracture mechanics criterion. While the initiation strength for this failure mode is higher than for the cross-ply configurations the residual strength after initiation is only marginally higher, providing virtually no margin of safety (10%). For cases involving cross-plies on either side of the interface, failure initiation occurs by matrix cracking with a critical strain across the fibers providing a universal failure criterion. In these cases the residual load bearing capability was 25 to 35% higher than the failure initiation loads. The interaction between moment and tension at failure initiation is linear, an observation that does not hold for the delamination failure driven by crack propagation. Assuming that time dependent aspects of the failure process are not dominant, elevated temperatures did not change the general results of how bending and tension loads interact, provided one accounts for residual thermal stresses; however the magnitude at which the failures occur depends on the temperature.
Author

Failure; Laminates; Composite Materials; Loads (Forces); High Temperature; Thickness; Structural Stability

19980220233 NASA Ames Research Center, Moffett Field, CA USA

Developments in Fibrous Refractory Composite Insulation

Leiser, Daniel B., NASA Ames Research Center, USA; Smith, Marnell, NASA Ames Research Center, USA; Goldstein, Howard E., NASA Ames Research Center, USA; American Ceramic Society Bulletin; Nov. 1981; Volume 60, No. 11, pp. 1201-1204; In English; 4th; Composites and Advanced Metals, 20-24 Jan. 1980, Cocoa Beach, FL, USA; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A family of high strength per unit density fibrous insulation materials has undergone preliminary development for heat-shielding advanced, reusable entry vehicles. These materials have a range of temperature capabilities dependent on composition. They have an unusually high thermal-shock resistance, an unusually high strain-to- failure, low thermal conductivity, and good morphological stability. One composition within the family, 22% aluminoborosilicate fiber (0.19 g/cc), has been successfully produced in a pilot plant and scaled up to full production. This fiber's additional strength makes it a desirable composition; it will be used on the third and fourth Space Shuttle vehicles. Another composition, 15% aluminoborosilicate fiber (0.14 g/cc) , has been adopted for use on limited parts of the third vehicle and as a replacement for the 0.14 g/cc density, rigid silica RSI on the fourth.
Author

Insulation; Fiber Composites; Density (Mass/Volume); Shock Resistance; Reusable Heat Shielding; Heat Shielding

19980220267 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

Measurement of the Thermal Expansion Coefficients of Carbon/Carbon Composites

Sato, Sennosuke, Ibaraki Univ., Japan; Kurumada, Akira, Ibaraki Univ., Japan; Kawamata, Kiyohiro, Ibaraki Univ., Japan; Sasaki, Tetsuya, Ibaraki Univ., Japan; Morita, Nobuyuki, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 75-82; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Carbon or graphite is used uniquely for various components because of their excellent physical properties at high temperature. Recently, many kinds of new carbons, which can be applied to different fields of high technology, such as rockets or space planes, nuclear reactors, and especially fusion reactor devices, have been successively developed. For application in these new fields, carbon or graphite is often used under extremely severe conditions, with temperatures exceeding 1000 C. Precise evaluation of thermal properties under such high temperatures is, thus, one of the most important subjects of researches in these high technological fields. In this paper, the thermal expansion coefficient measuring apparatus, developed by the authors using image sensors and a high temperature furnace made of a graphite heater, is introduced in detail. Using this apparatus, the thermal expansion coefficients of three kinds of C/C composites and a fine grain isotropic graphite for comparison were measured. It was experimentally confirmed that the apparatus developed here has the capability of measuring the thermal expansion coefficients of materials up to 2200 C.
Author

Carbon-Carbon Composites; Graphite; Thermal Expansion; Measuring Instruments

25
INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19980218957 Osaka City Univ., Dept. of Applied Physics, Japan
Single- and double-photoionization of sulfur dioxide
Masuoka, Toshio, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 147-154; In English; Also announced as 19980218948
Contract(s)/Grant(s): MOE-08640651; MOE-06640663; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Single- and double-photoionization processes of sulfur dioxide (SO2) have been studied in the photon energy region of 37-120 eV by use of time-of-flight mass spectrometry and the photoion-photoion-coincidence method together with synchrotron radiation. The single- and double-photoionization cross sections of SO2 are determined. Ion branching ratios and the partial cross sections for the individual ions respectively produced from the parent SO2(+) and SO2(2+) ions are determined separately at excitation energies where the molecular and dissociative single- and double-photoionization processes occur simultaneously. Dissociation of the parent ions is dominant both in single and double photoionization. The thresholds for the O(+) + SO(+) and O(+) + S(+) dissociation channels of SO2(2+) are at 35.0 +/- 0.5 and 37.7 +/- 0.5 eV, respectively.
Author
Photoionization; Sulfur Dioxides; Time of Flight Spectrometers; Photons; Ionization

19980219324 NASA Lewis Research Center, Cleveland, OH USA
Excited State Charge Transfer Behavior in 2,3,5,6-Tetraaryl Substituted Benzo [1,2-b:4,5-b']difurans: Evidence for Tandem TICT Formation
Abdul–Aziz, Mahmoud, Case Western Reserve Univ., USA; Auping, Judith V., NASA Lewis Research Center, USA; Hess, Andrea, NASA Lewis Research Center, USA; Kinder, James D., NASA Lewis Research Center, USA; Meador, Michael A., NASA Lewis Research Center, USA; Hardy–Green, DeNise, Akron Univ., USA; Youngs, Wiley, Akron Univ., USA; 1997; 38p; In English; 213th, 13-18 Apr. 1997, San Francisco, CA, USA; Sponsored by National Advisory Committee on Semiconductors, USA
Contract(s)/Grant(s): RTOP 523-22-13; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In 1962, Lippert reported that p-N,N-dimethylaminobenzonitrile (DMABN) exhibited fluorescence behavior unlike that of other simple benzene derivatives. In addition to the "normal" L(sub b) observed for substituted benzenes, a second emission band was observed at longer wavelengths. This band was sensitive to solvent polarity, experiencing fairly large bathochromic shifts in polar vs. hydrocarbon solvents, and was suggested to arise from a polar L(sub a) state. Originally, Lippert proposed that the dual fluorescence behavior of DMABN arose from a solvent induced reversal of the L(sub b) and L(sub a) states. However, this explanation proved inadequate for other p-substituted-N,N- dialkylanilines. Further work by Grabowski and others led to the postulation of a second mechanism - Twisted Intramolecular Charge Transfer (TICT). Under the TICT model, the L(sub b) or locally excited (LE), state is formed directly upon excitation of DMABN. The geometry of the L(sub b) state resembles that of the ground state, where the nitrogen lone pair orbital and the aryl pi system are coplanar. Fluorescence from the L(sub b) state produces the short wavelength band in the emission spectrum. Conversion of the state to a polar TICT state occurs via a 90 deg rotation about the aryl-nitrogen bond followed by electron transfer and reorganization of the surrounding solvent cavity. The geometry of the resulting charge transfer state has the amine group rotated such that the nitrogen lone pair orbital is orthogonal to the aromatic pi system. Since there is little or no overlap between the nitrogen n orbital and the aromatic pi system, charge delocalization is not possible and the TICT state has a large dipole moment. The TICT mechanism has been confirmed by restricting bond rotation in these systems, either by incorporation of the amine into a ring system or through the use of sterically bulky substituents ortho to the amine.
Derived from text
Excitation; Planar Structures; Hydrocarbons; Ground State; Emission Spectra; Dipole Moments

19980219353 College of William and Mary, Dept. of Physics, Williamsburg, VA USA
HALOE Science Investigation *Final Report*
Benner, D. Chris, College of William and Mary, USA; May 1998; 10p; In English
Contract(s)/Grant(s): NCC1-43; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This cooperative agreement has investigated a number of spectroscopic problems of interest to the Halogen Occultation Experiment (HALOE). The types of studies performed are in two parts, namely, those that involve the testing and characterization of correlation spectrometers and those that provide basic molecular spectroscopic information. In addition, some solar studies were performed with the calibration data returned by HALOE from orbit. In order to accomplish this a software package was written as part of this cooperative agreement. The HALOE spectroscopic instrument package was used in various tests of the HALOE flight instrument. These included the spectral response test, the early stages of the gas response test and various spectral response tests of the detectors and optical elements of the instruments. Considerable effort was also expended upon the proper laboratory setup for many of the prelaunch tests of the HALOE flight instrument, including the spectral response test and the gas response test. These tests provided the calibration and the assurance that the calibration was performed correctly.
Derived from text
Halogen Occultation Experiment; Spectrometers; Calibrating; Applications Programs (Computers); Data Processing; Computation

19980220231 NASA Marshall Space Flight Center, Huntsville, AL USA
In Situ Studies of Precipitate Formation in Al-Pb Monotectic Solidification by X-Ray Transmission Microscopy
Kaukler, William F., Alabama Univ., USA; Rosenberger, Franz, Alabama Univ., USA; Curreri, Peter A., NASA Marshall Space Flight Center, USA; Metallurgical Transactions A - Physical Metallurgy and Materials; Aug. 1997; ISSN 0360- 2133; Volume 28A, pp. 1705-1710; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Al-1.5 wt per Pb monotectic alloys were unidirectionally solidified. X-ray Transmission Microscope (XTM) observations, both during and after solidification, revealed various new morphological/compositional features in the melt and solid. In the melt, nonuniform lead-rich interfacial segregation layers and droplets were observed to form well ahead of the interface. In the solid, periodic striae formed at translation/solidification velocities as low as 6 x 10(exp -6) m/s. The striae shape does not replicate that of the interface. The striae spacing decreases from 4 to 2 x 10(exp 4) m with an increasing solidification rate between 6 and 16 x 10(exp -6) m/s. High resolution postsolidification XTM examination reveals that these striae consist of Pb-rich particles of 2 to 3 x 10(exp -6) m diameter. At translation/solidification velocities below 6 x 10(exp -6) m/s, Pb incorporation into the solid occurs in the form of continuous fibers and strings of particles of about 5 x 10(exp -6) m diameter. Bands, parallel to the interface, in which these fibers were aligned in the solidification direction, alternated with bands of poor fiber alignment. The width of these bands is comparable to the striae spacings obtained at the high solidification rates.
Author
Aluminum; Lead (Metal); Solidification; Monotectic Alloys; Precipitates

19980220334 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Liquid Phase Hydrogenation of Crotonaldehyde over Silver-Alumina Catalyst
Nagase, Yoshinori, Ibaraki Univ., Japan; Sato, Takuji, Ibaraki Prefectural Office, Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 213-219; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The liquid phase hydrogenation of crotonaldehyde over silver alumina catalyst has been investigated to examine relationships between catalytic activity and selectivity to 2-buten-1-ol. The catalytic activity for the reaction on a reducing silver catalyst supported on silica or manganese dioxide decreased, but the activity and selectivity for the reaction on silver-alumina catalyst did not decrease in spite of a high reducing temperature of the catalyst. Using silver-alumina catalyst added with manganese, the reaction improved up to about 10% in the selectivity, without lowering of it's activity. Yields of 2-buten-1-ol on silver-alumina catalyst and silver manganese/alumina catalyst were 48.3% and 60.5%, respectively.
Author
Hydrogenation; Catalysts; Liquid Phases; Catalytic Activity; Aldehydes

19980220441 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Liquid-Phase Hydrogenation of Crotonaldehyde over Silver-Silica Alumina Catalyst
Nagase, Yoshinori, Ibaraki Univ., Japan; Takahashi, Toshiyuki, Hitachi Ltd., Japan; Hirabayashi, Kazuko, Hitachi Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 221-223; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The liquid phase hydrogenation of crotonaldehyde has been investigated using silver/silica -alumina catalyst. Relations between acidity, acid species, and 2-buten-1-ol yield were examined. The catalytic activity was dependent on Lewis acid amount and independent on Bronsted acid amount. 2-Buten-1-ol yield was dependent on Lewis acid amount.
Author
Hydrogenation; Liquid Phases; Catalytic Activity; Catalysts; Acidity

19980220552 Helsinki Univ. of Technology, Electron Physics Lab., Espoo, Finland
Light Emission from Silicon: Porous Silicon. Postgraduate Course in Electron Physics II, Spring 1998
Sinkkonen, J., Helsinki Univ. of Technology, Finland; May 8, 1998; ISSN 0355-5712; 240p; In English
Report No.(s): PB98-163413; ISBN 951-22-4063-7; Copyright Waived; Avail: CASI; A11, Hardcopy; A03, Microfiche
Contents include the following: Introduction; Structure of Porous Silicon; Effect of Preparation on the Porous Silicon Structure; Optical Properties; Porous Silicon by Stain Etching; and Problems.
NTIS
Photoluminescence; Porous Silicon; Electroluminescence

19980221237 Environmental Protection Agency, National Risk Management Research Lab., Research Triangle Park, NC USA
Characterization of Metal Benzotriazoles and Related Polymers
Wasson, S. J., Environmental Protection Agency, USA; Kerzic, M. C., Wingate Univ., USA; Hall, J. W., Wingate Univ., USA; Cates, M. A., Advanced Materials, USA; Wasson, J. R., Advanced Materials, USA; 1998; 12p; In English
Report No.(s): PB98-163108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Benzotriazole (bta-H) is well-known corrosion inhibitor for copper, copper-alloy, and other metal surfaces. Particles from these surface treatments will ultimately contribute to environmental indoor dust or outdoor industrial effluent, but they have not been fully characterized. Bta-H is one of a group of several organic ligands which bind to transition metals and which have similar structures. We have systematically investigated approximately 30 transition metal complexes of the general formula ML(sub 2), where M = VO(2+), MN(2+), Co(2+), Ni(2+), Cu(2+), and Zn(2+), and L = deprotonated benzotriazole, imidazole, benzimidazole, 2-methylimidazole, or 2-methylbenzimidazole. Where possible, these materials have been synthesized and characterized by chemical analysis, spectroscopy, and x-ray diffraction techniques.
NTIS
Benzene; Corrosion Prevention; Complex Compounds; Chemical Analysis; Azoles; X Ray Diffraction

19980221273 Massachusetts Inst. of Tech., Dept. of Earth, Atmospheric and Planetary Sciences, Cambridge, MA USA
Temperature Dependence of the Rate Constant and Branching Ratio for the OH + ClO Reaction
Lipson, Jennifer B., Massachusetts Inst. of Tech., USA; Elrod, Matthew J., Massachusetts Inst. of Tech., USA; Beiderhase, Thomas W., Massachusetts Inst. of Tech., USA; Molina, Luisa T., Massachusetts Inst. of Tech., USA; Molina, Mario J., Massachusetts Inst. of Tech., USA; J. Chem. Soc.; 1997; Volume 93, No. 16, pp. 2665-2673; In English
Contract(s)/Grant(s): NAG5-3947; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche
The overall rate constant and branching ratio for the OH + ClO reaction have been measured using the turbulent flow technique with high-pressure chemical ionization mass spectrometry for the detection of reactants and products. At 298 K and ca. 100 Torr pressure, the overall rate constant was determined to be (1.46 +/- 0.23) x 10(exp -11) cc/ molecule s. The temperature dependence of the rate constant was investigated between 205 and 298 K, yielding the following Arrhenius expression: (5.5 +/- 1.6) x 10(exp -12) exp[(292 +/- 72)/T] cc /molecule s. For the branching ratio studies OD was used instead of OH, making it possible to observe directly the production of DCl from the minor channel of the OD + ClO reaction. The temperature dependence of the rate constant for this minor channel was investigated between 210 and 298 K, yielding the following Arrhenius expression: (1.7 +/- 0.3) x 10(exp -13) exp[(363 +/- 50)/T] cc/ molecule s. The branching ratio for the DCl channel was found to range from 0.05 +/- 0.02 at 298 K to 0.06 +/- 0.02 at 210 K.
Author
Temperature Dependence; Chemical Reactions; Ionization; Hydrogen; Chlorine Oxides; Oxygen

26
METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19980220174 NASA Langley Research Center, Hampton, VA USA
Quantitative Examination of Corrosion Damage by Means of Thermal Response Measurements
Rajic, Nik, NASA Langley Research Center, USA; Jun. 1998; 30p; In English
Contract(s)/Grant(s): RTOP 538-02-11-01
Report No.(s): NASA/TP-1998-208429; NAS 1.60:208429; L-17734; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two computational methods are presented that enable a characterization of corrosion damage to be performed from thermal response measurements derived from a standard flash thermographic inspection. The first is based upon a one dimensional analytical solution to the heat diffusion equation and presumes the lateral extent of damage is large compared to the residual structural thickness, such that lateral heat diffusion effects can be considered insignificant. The second proposed method, based on a finite element optimization scheme, addresses the more general case where these conditions are not met. Results from an experimental application are given to illustrate the precision, robustness and practical efficacy of both methods.
Author
Corrosion; Thermography; Finite Element Method; Heat Transfer; Infrared Inspection; Nondestructive Tests

19980220542 International Trade Commission, Secretary to the Commission, Washington, DC USA
Certain Steel Wire Rod from Canada, Germany, Trinidad and Tobago, and Venezuela: Investigations Nos. 731-TA-763-766 ***Final Report***
Mar. 1998; 66p; In English
Report No.(s): PB98-160302; USITC/PUB-3087; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 733(a) of the Tariff Act of 1930 (19 USC sec. 1673b(a))(the Act), that an industry in the USA is not materially injured or threatened with material injury, and the establishment of an industry in the USA is not materially retarded, by reasons of imports from Canada, Germany, Trinidad and Tobago, and Venezuela of certain steel wire rod, provided for in subheadings 7213.91.30, 7213.91.45, 7213.91.60, 7213.99.00, 7227.20.00, and 7227.90.60 of the Harmonized Tariff Schedule of the USA, that have been found by the Department of Commerce (Commerce) to be sold in the USA at less than fair value (LTFV).
NTIS
Steels; International Trade; Commerce; Rods; Wire; Investigation; Iron

19980221229 Helsinki Univ. of Technology, Dept. of Materials Science and Rock Engineering, Espoo, Finland
Report 1997 of the Laboratory of Metallurgy, Department of Material Science and Rock Engineering, Helsinki University of Technology ***Annual Report***
Pohjola, M., Helsinki Univ. of Technology, Finland; 1998; 38p; In English
Report No.(s): PB98-162621; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The current research activities focus on physicochemical fundamentals and the modelling of metallurgical operations. Processes that benefit from this research include modern extractive processes for ferrous and non-ferrous metals, casting and solidification of molten products and materials synthesis at high temperatures. A highlight of 1997 was increased participation in European joint research. The Laboratory of Metallurgy acted as partner or subcontractor in four European Coal and Steel Community (ECSC) Projects. The laboratory also participated in international student exchange programs and assisted in the organizations of several multi-partner student seminars.
NTIS
Universities; Rock Mechanics; Organizations; Research Projects

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

19980218952 Osaka City Univ., Japan
Polymerization of alkyl methacrylates with V (acac)3-AIEt3 catalyst
Endo, Kiyoshi, Osaka City Univ., Japan; Inukai, Akihiro, Osaka City Univ., Japan; Otsu, Takayuki, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 23-25; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Polymerizations of methyl methacrylate, ethyl methacrylate, isopropyl methacrylate, n-butyl methacrylate, and tert-butyl methacrylate with V(acac)3-AlEt3 catalyst were investigated. It was found that all monomers examined polymerized with the V(acac)3-AlEt3 catalyst, and the polymerization rates were influenced by the alkyl ester substituents of alkyl methacrylates. Since the polymerization of the alkyl methacrylates did not take place with each single component at -78 C, both components are necessary to produce the active site for the polymerization.
Author
Alkyl Compounds; Polymerization; Methyl Compounds; Catalysts; Acrylates; Isopropyl Compounds; Monomers

19980218998 University of Electro-Communications, Dept. of Applied Physics and Chemistry, Tokyo, Japan
Adhesion of Ni-Cu Films dc Biased Plasma-Sputter-Deposited on MgO (001)
Qiu, Hong, University of Electro-Communications, Japan; Ishino, Masaki, University of Electro-Communications, Japan; Hashimoto, Mituru, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; Dec. 1996; ISSN 0915-0935; Volume 9, No. 2, pp. 29-35; In English; 57th; Japanese Applied Physical Society; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Ni-Cu alloy films 70 nm thick are deposited on MgO (001) at 230 C by dc plasma-sputtering at 2.7kV in pure Ar gas using a Ni90Cu10 target. A dc bias voltage V(s) of 0, -60, -110 or -140V is applied to the substrate during deposition. The adhesion of the film to the substrate is studied by scratch test as a function of V(s). The application of V(s) is very effective in increasing the adhesion of the film to the substrate. In conclusion, the adhesion of the film to the substrate increases with cleaning the surface of the substrate by sputtering off impurity admolecules during the film formation due to the energetic Ar(+) particle bombardment.
Author
Adhesion; Deposition; Nickel Alloys; Copper Alloys; Thin Films; Magnesium Oxides; Metal Films

19980219323 NASA Lewis Research Center, Cleveland, OH USA
Fluoropolymers and Chemistry Technology Development and Transfer at NASA Lewis Research Center
Sutter, James K., NASA Lewis Research Center, USA; 1997; 35p; In English, 16-18 Nov. 1997, Bermuda; Sponsored by International Society for Optical Engineering, USA
Contract(s)/Grant(s): RTOP 523-21-13; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Three areas of fluoropolymers research at NASA Lewis Research Center will be presented at the SPI Fluoropolymer Fall '97 Conference. The developments and technology transfer of the three areas discussed at the meeting will be FEP as thermal protection for space structures (Hubble Space Telescope), surface science developments for PTFE and high temperature fluorinated polymers for advanced aircraft engines. This talk will focus on the technology transfer of these three fluoropolymer applications.
Author
Thermal Protection; Technology Transfer; Large Space Structures; Fluoropolymers; Technology Assessment

19980219325 NYMA, Inc., Brook Park, OH USA
A Reaction Forming Method for Joining of Silicon Carbide-Based Ceramics
Singh, Mrityonjay, NYMA, Inc., USA; [1997]; 6p; In English; Scripta Materialia, USA
Contract(s)/Grant(s): NAS3-27186; RTOP 274-00-00; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Recently, there has been a surge of interest in the development and testing of silicon carbide based ceramic components for a number of high temperature applications in aerospace and ground based systems. The engineering design often requires fabrication of complex shaped components which are quite expensive. One attractive way of achieving this is to build up complex shapes by joining geometrically simple shapes. Joining is recognized as one of the enabling technologies for the application of silicon carbide based ceramic components for these demanding applications. An overview of various joining options i.e., mechanical fastening, adhesive bonding, welding, brazing, and soldering has been described in recent publications. The majority of the tech-

niques used today are based on the joining of monolithic ceramics with metals either by diffusion bonding, metal brazing, brazing with oxides and oxynitrides, and diffusion welding. These techniques require high temperatures for processing combined in some cases with high pressure for hot pressing. The joints produced by these techniques have different thermal expansion coefficients than the ceramic which creates stress concentration in the joint area. Generally, the use temperatures for these joints are below 700 C. Thus, in order to utilize the full potential of these ceramics, new joining approaches are needed to produce strong and tough high temperature joints. The joints produced by these new techniques should ideally maintain their integrity at higher temperatures and exhibit good mechanical properties and environmental stability. Also, the joining technique should be robust practical, and reliable. In the search for high temperature joints of silicon carbide-based ceramics, various joining techniques have been recently investigated. Joint interlayers have been produced using polymer pyrolysis, in situ displacement reactions, and tape casting/reaction bonding processes. The polymer derived joints have lower strength due to porosity and microcrystallinity. On the other hand, hot pressing or high temperature fixturing is needed for in situ displacement reactions and tape casting/reaction bonding techniques. Conventional resistance heating sources have been utilized in majority of these joining techniques. In addition to conventional resistance heating, microwave and infrared heating sources have also been utilized.
Derived from text
Procedures; Adhesive Bonding; Ceramics; Diffusion Welding; Hot Pressing; Metal Bonding; Soldering

19980219328 NASA Lewis Research Center, Cleveland, OH USA
Analysis of Thermal Radiation Effects on Temperatures in Turbine Engine Thermal Barrier Coatings
Siegel, Robert, NASA Lewis Research Center, USA; Spuckler, Charles M., NASA Lewis Research Center, USA; 1997; 10p; In English; Thermal Barrier Coatings, 19-21 May 1997, Fort Mitchell, KY, USA; Meeting sponsored by Thermal Barrier Coatings Interagency Coordinating Committee
Contract(s)/Grant(s): RTOP 523-26-13; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Thermal barrier coatings are important, and in some instances a necessity, for high temperature applications such as combustor liners, and turbine vanes and rotating blades for current and advanced turbine engines. Some of the insulating materials used for coatings, such as zirconia that currently has widespread use, are partially transparent to thermal radiation. The importance of radiation effects within thermal barrier coatings in a turbine engine was briefly discussed. A translucent coating permits energy to be transported internally by radiation, thereby increasing the total energy transfer and acting like an increase in thermal conductivity. This degrades the insulating ability of the coating. Because of the strong dependence of radiant emission on temperature, internal radiative transfer effects are increased as temperatures are raised. Hence evaluating the significance of internal radiation is of importance as temperatures are increased to obtain higher efficiencies in advanced engines. In a combustor there is radiation from the flame, soot, and hot gases to the combustor liner, first stage turbine vanes, and to some extent to the first stage blades. When a thermal barrier coating is subjected to the combustion environment it will usually become covered with a thin layer of soot. Radiation is then absorbed by the soot, and is partially reradiated into the coating. Coatings in the combustor are considered with both clean and soot covered surfaces; for the turbine the results here are for clean surfaces. Within a hot coating there is internal radiant emission, absorption, and scattering. These mechanisms combine to provide a transport of radiative energy within the coating that acts in combination with heat conduction. Internal radiative effects depend on the properties of the coating materials. If coatings can be made opaque then internal radiation is not a concern, and the only radiative exchange is at the exposed surface of the coating and, for some conditions, at the cooled side of the metal wall. However, some high temperature ceramic materials are somewhat translucent so internal radiation effects can occur, and their importance must be quantitatively evaluated to determine if they are a design consideration. Zirconia is somewhat translucent for radiation in the wavelength range below approximately 5 to 7 microns, and is often approximated as being opaque for wavelengths larger than 5 microns. Zirconia has large scattering compared with absorption. At turbine engine temperatures a considerable portion of blackbody radiant energy is in the translucent wavelength range for zirconia.
Derived from text
Thermal Radiation; Temperature Effects; Turbine Engines; Coating; Barrier Layers

19980220264 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Evaluation of Thermal Shock Resistances of Boronized Graphite for Fusion Reactor Devices
Sato, Sennosuke, Ibaraki Univ., Japan; Kurumada, Akira, Ibaraki Univ., Japan; Kawamata, Kiyohiro, Ibaraki Univ., Japan; Iwai, Masanori, Ibaraki Univ., Japan; Yasuda, Sigeo, Ibiden Co. Ltd., Japan; Mizutani, Takayuki, Ibiden Co. Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 109-116; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Graphites have been extensively used as plasma-facing components for fusion reactor devices because of the suitability of their physical properties and excellent heat resistance. However, graphites have a shortcoming in that they scatter a large quantity

of carbon impurities in plasma due to erosions by plasma interactions. Hirooka, et al. reported that adding Boron Carbide (B4C) to graphites can significantly improve plasma confinement performance. But, from the view point of mechanical and physical properties of the boronized graphite, a concern can be expressed about possible deterioration of its thermal shock resistance against plasma disruption in the fusion reactor devices. In this study, boronized graphites (containing 10 wt% B4C), referred to in the reports by Hirooka, et al., are produced and used to evaluate experimentally their thermal shock resistances and a series of mechanical and fracture mechanics properties. The characteristics of the thermal shock resistance and fracture toughness of the materials, when subjected to plasma disruption, are then discussed and compared with the isotropic graphites presently used as the plasma-facing components for fusion reactor devices.
Author
Boron Carbides; Additives; Fusion Reactors; Graphite; Shock Resistance; Thermal Shock; Mechanical Properties; Controlled Fusion

19980220270 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Utilization of Coal Fly Ash as a Lightweight Geotechnical Material
Yasuhara, Kazuya, Ibaraki Univ., Japan; Sato, Ken–ichi, Ibaraki Univ., Japan; Adachi, Masaki, Ibaraki Univ., Japan; Kenkyo, Koji, Ibaraki Univ., Japan; Horiuchi, Sumio, Shimizu Co. Ltd., Japan; Kusakari, Taichi, Shimizu Co. Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 41-52; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Increasingly coal fly ash has been used as a construction material in recent years. More than 4 million tons of coal ash have been discharged annually from coal powder plants in Japan. At present, 60% is disposed of sea reclamation areas. Therefore it is important to promote the utilization of fly ash for other areas of geotechnical engineering. The authors have performed a fundamental study on the use of fly ash as lightweight geotechnical material. At the laboratory, coal ashes were mixed with form additive and cement to produce stable specimens of lightweight material which were then used for an investigation of the strength and compressibility characteristics from a geotechnical point of view. Mechanical properties were investigated using a series of oedometer tests, triaxial creep tests, and static and cyclic triaxial tests. The utilization of fly ash as a lightweight material was considered by carrying out simple calculations of bearing capacity for the foundations of structures.
Author
Fly Ash; Powder (Particles); Additives; Fabrication; Waste Utilization; Industrial Wastes; Coal; Mechanical Properties

19980220437 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Computer Simulation of Film Growth Process on the 2D Penrose Pattern
Tanaka, Hideki, Ibaraki Univ., Japan; Sasajima, Yasushi, Ibaraki Univ., Japan; Ichimura, Minoru, Ibaraki Univ., Japan; Itaba, Masanori, Ibaraki Univ., Japan; Ozawa, Satoru, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 225-230; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We performed computer simulation of film growth process on the two-dimensional Penrose pattern which is considered as a typical structural model of quasicrystal. Atomistic structure was calculated as a function of time under a various condition of atomic binding energy, temperature, and deposition rate. Canonical Monte Carlo method based upon solid-on-solid model was utilized for the present calculation. We found a strong geometrical restriction on the growth front of grains on the 2D Penrose pattern, which is also expected for the case of the growth of a real quasicrystal.
Author
Computerized Simulation; Crystal Growth; Monte Carlo Method; Crystal Structure

19980220442 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
An Evaluation of Mechanical Properties of Carbon Materials by Hardness Test
Oku, Tatsuo, Ibaraki Univ., Japan; Ohta, Shinya, Ibaraki Univ., Japan; Eto, Motokuni, Japan Atomic Energy Research Inst., Japan; Kuroda, Koji, Toyo Tanso Co. Ltd., Japan; Tanamura, Takeshi, Shikibo Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 205-211; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A dynamic ultra-microhardness test, bending tests, and Young's modulus measurements were performed on three grades of C/C composites and twelve grades of nuclear graphite. In hardness tests the indented load (L) versus depth (h) curves were obtained on loading and unloading processes. The parameters B and D were obtained by using L/h versus h relationships on loading and unloading processes, respectively. The correlations of the mean value of B with the bending strength and of the mean value of D with the Young's modulus were examined. As a result, no clear proportional correlations were found between the B and D values and the bending strength and Young's modulus of all of the tested carbon materials, respectively. However, correlations

were found between bending strength and mean value of B on most of the graphite materials and between Young's modulus and mean value of D on fiber axis direction of a C/C composite. The correlations between the strength and Young's modulus of fine structures of the C/C composite have been evaluated.
Author
Hardness Tests; Mechanical Properties; Carbon-Carbon Composites; Bend Tests; Modulus of Elasticity; Graphite

19980221272 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
Wave Ducting in Different Wave Modes
Calvert, W., Iowa Univ., USA; Journal of Geophysical Research; 1995; ISSN 01480227; 10p; In English
Contract(s)/Grant(s): NAG5-1926; NAG5-5023; NAG8-1030
Report No.(s): Paper-95JA01131; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Ducting by magnetic-field-aligned density irregularities is found to occur in seven regions of parameter space defined by plasma resonance (P = 0), unity refractive index (n(sub 0) = 1), longitudinal refractive-index curvature reversal (n(sub 0, sup 2) = -P), and the boundary between ordinary and extraordinary propagation (n(sup 0, sup 2) = + P), where n(sup 0, sup 2) = R or L is the squared refractive index in the direction of the magnetic field and P, R, and L are the Stix parameters for wave propagation in a plasma. Ducting in the ordinary and extraordinary modes is found to occur in troughs, whistler ducting is found to occur in troughs and crests respectively above and below its curvature reversal at approximately half the cyclotron frequency, and ducting in the Z mode is found to occur in troughs from the Z cutoff to a curvature reversal about halfway between cutoff and the plasma frequency, in crests up to the plasma frequency, and then also in crests between the plasma and cyclotron frequencies whenever the latter is greater than the former. The strength of ducting, which is characterized by the square of the ducted wave angle divided by the fractional density deviation of the duct, is found to be proportional to the refractive-index radius of curvature and the rate of increase of refractive index with density. Strongest ducting is thus found to occur in the Z mode below curvature reversal, and the weakest at low densities near the plasma frequency.
Author
Wave Propagation; Ducts; Cyclotron Frequency; Plasma Frequencies

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

19980220258 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
A Study of Ignition and Combustion Characteristics of Compound Liquid Fuels, Report 1, Behaviors on Hot Surface
Sawa, Norihiro, Ibaraki Univ., Japan; Hori, Shozo, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 181-187; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In recent years, it is very important for us to develop the substitute fuels of IC engines instead of fossil fuels for energy shortages. The most hopeful liquid fuel for diesel engine are methanol and its compound fuels in emulsified or melting states with gas-oil or water etc. In this study, the authors experimentally investigated the characteristics of how these fuels changed each component ratio on hot surface, that is, evaporation, ignition delay, combustion, and its patterns from fundamental points of view.
Author
Diesel Engines; Methyl Alcohol; Combustion; Liquid Fuels

19980220259 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
A Study on Effective Utilization of Biomass Energy, Report 4, Adaptability of turpentine Oil for Compression Ignition Engine
Sawa, Norihiro, Ibaraki Univ., Japan; Hori, Shozo, Ibaraki Univ., Japan; Kamida, Koji, Honda Giken Kogyo K.K., Japan; Ueno, Yasushi, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 165-179; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

As alternative fuels for compression-ignition engine, blend fuels of gas oil and turpentine oil, and ones of turpentine oil and castor oil, palm oil, sunflower oil were used for pre-combustion chamber CI engine. and then, the effects of these blend fuels on engine performance, exhaust emission, and combustion process were investigated. The effects of higher injection pressure of blend fuel was investigated. The behavior of the fuel spray at higher injection pressure was observed by the liquid injection technique. and the fuel rate at higher injection pressure was measured by Bosch method. Consequently, it was found that: (1) Thermal

efficiency for the blend fuel of turpentine oil and gas oil was decreased over 40% of turpentine oil rate. Bosch smoke was decreased above the fuels used, but NO(x) was increased with increase of turpentine oil rate. (2) The addition of plant, such as castor, sunflower, palm oils was effective on thermal efficiency and NO(x) compared with turpentine oil, then the value of thermal efficiency and NO(x) was closed to gas oil's value. (3) Generally, thermal efficiency was increased, ignition lag was decreased with increasing fuel injection pressure. (4) by measuring the liquid injection technique, it was showed that spray penetration was longer and then spray impingement on the top of pre-chamber was increased with higher injection pressure. (5) The fuel rate measurement with higher injection pressure was observed to be shorter injection duration, increase maximum fuel rate, and slight increase fuel rate rising curve.
Author
Biomass; Nitrous Oxides; Diesel Engines; Fuel Oils; Ignition; Turpentine; Combustion

19980220260 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
A Study on Effective Utilization of Biomass Energy, Report 3, Adaptability of Fish Oil for Compression Ignition Engine
Sawa, Norihiro, Ibaraki Univ., Japan; Hori, Shozo, Ibaraki Univ., Japan; Kamida, Koji, Honda Giken Kogyo K.K., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 157-164; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

At the present time, new energy sources instead of fossil fuels are expected in a global scale. In this paper, the fuel characteristics of fish oil (chiefly sardine-oil) for compression ignition engine were investigated by measuring those fundamental combustion properties, that is, evaporation, ignition delay and combustion of fuel droplet on hot surface and of that suspended in heat balance apparatus. Moreover, power characteristics and exhaust emissions were tested with engine using those biomass oil. and the experimental results as fish oil were compared with the values for diesel fuel, rape-seed oil fuel and diesel-tar mixed fuel. The viscosity of fish oil is considerable high than that of diesel fuel, consequently it's spray atomization is bad and then engine performance is lower than that of diesel fuel operation. Therefore, it is necessary to dilute fish oil by gasoline for good atomization.
Author
Fishes; Biomass; Oils; Energy Technology; Performance Tests

19980220444 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
A Study of Ignition and Combustion Characteristics of Compound Liquid Fuels, Report 2, Behaviors in High Temperature Environment
Sawa, Norihiro, Ibaraki Univ., Japan; Hori, Shozo, Ibaraki Univ., Japan; Minowa, Toshimichi, Hitachi Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 189-196; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Evaluations of ignition and combustion characteristics of compound liquid fuels were carried out with a heat balance analyzer. In recent years, it is very important for us to develop the substitute fuels of IC engines for energy shortage. Most hopeful liquid fuels for the diesel engine are methanol and its compound fuels in emulsified or melting states with gas-oil, water and castor oil. In this study, the authors investigated experimentally some physical properties (that is, the characteristics of evaporation velocity, ignition, combustion, and its B values) of various compound fuels changing each component ratio (Y, R(m), R(h), R(hm)) from a fundamental point of view.
Author
Diesel Engines; Liquid Fuels; Ignition; Combustion; Physical Properties; Methyl Alcohol

29
MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications. For biological materials see 55 Space Biology.

19980219308 NASA Lewis Research Center, Cleveland, OH USA
Microgravity Fluid Separation Physics: Experimental and Analytical Results
Shoemaker, J. Michael, Aerospace Design and Fabrication, Inc., USA; Schrage, Dean S., Aerospace Design and Fabrication, Inc., USA; 1997; 6p; In English; 35th; Aerospace Sciences, 6-9 Jan. 1997, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-27186; RTOP 962-24-00; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Effective, low power, two-phase separation systems are vital for the cost-effective study and utilization of two-phase flow systems and flow physics of two-phase flows. The study of microgravity flows have the potential to reveal significant insight into the controlling mechanisms for the behavior of flows in both normal and reduced gravity environments. The microgravity environment results in a reduction in gravity induced buoyancy forces acting on the discrete phases. Thus, surface tension, viscous, and inertial forces exert an increased influence on the behavior of the flow as demonstrated by the axisymmetric flow patterns. Several space technology and operations groups have studied the flow behavior in reduced gravity since gas-liquid flows are encountered in several systems such as cabin humidity control, wastewater treatment, thermal management, and Rankine power systems.
Author
Microgravity; Flow Distribution; Separators; Experimentation; Numerical Analysis; Two Phase Flow; Gravitational Effects

19980221270 NASA Lewis Research Center, Cleveland, OH USA
Fluid Interface Phenomena in a Low-Gravity Environment: Recent Results from Drop Tower Experimentation
Weislogel, Mark M., NASA Lewis Research Center, USA; 1997; 34p; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Drop towers used as experimental facilities have played a major role in the development of fundamental theory, engineering analysis, and the proofing of system designs applicable to fluid interface phenomena in a low-gravity environment. In this paper, the parameters essential to the effective use of drop tower experiments relevant to fluid interfaces with constant fluid properties are reviewed. The often dramatic influence of the contact angle and the uncertainty of the moving contact line boundary condition are emphasized. A number of sample problems buttressed by recent results from drop tower tests are discussed; these clearly demonstrate the role of inertia and the controlling influence of surface wettability and container geometry for the large length scale capillary flows that arise in fluid systems in space.
Author
Drop Towers; Experimentation; Capillary Flow; Boundary Conditions

19980221276 NASA Lewis Research Center, Cleveland, OH USA
Equilibration near the Liquid-Vapor Critical Point in Microgravity
Wilkinson, R. Allen, NASA Lewis Research Center, USA; Zimmerli, G. A., NYMA, Inc., USA; Hao, Hong, Maryland Univ., USA; Moldover, Michael R., National Inst. of Standards and Technology, USA; Berg, Robert F., National Inst. of Standards and Technology, USA; Johnson, William L., Westminster Coll., USA; Ferrell, Richard A., Maryland Univ., USA; Gammon, Robert W., Maryland Univ., USA; Mar. 14, 1997; 61p; In English
Contract(s)/Grant(s): NAG3-1395; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We used interferometry to measure the density changes associated with the late stage of thermal equilibration near the liquid-vapor critical point of SF6. This experiment was performed on board the Space Shuttle in the absence of the considerable obscuring effects of gravity. The density changes were analyzed in terms of the exponentially decaying modes predicted by a model for heat diffusion in an isothermal container. The time constants depended only on the temperature and not on the sample's history. In the temperature range from Tc + 98 mK to Tc + 28 mK, where Tc = 319 K is the critical temperature, the values of the thermal diffusivity D(sub T) derived from the time constants at each temperature are consistent with the values of D(sub T) found by previous dynamic light scattering measurements. From Tc + 9 mK to Tc + 1.4 mK, where Earth-based measurements of D(sub T) are unavailable, the measured values of D(sub T) agree with an asymptotically correct extrapolation of D(sub T) closer to Tc. These data confirm our understanding of thermal equilibration in a range of T - Tc where measurements on Earth are severely influenced by gravitationally-induced convection and stratification of the sample.
Author
Critical Temperature; Liquid-Vapor Equilibrium; Critical Point; Interferometry; Density (Mass/Volume); Gravitational Effects

31
ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19980218997 University of Electro-Communications, Science and Technology, Tokyo, Japan
Education and Ability Evaluation of Measurement Operator in Instrumentation Engineering
Yano, Hiroshi, University of Electro-Communications, Japan; Takahashi, Kazuhito, University of Electro-Communications, Japan; Yamato, Toshiaki, University of Electro-Communications, Japan; Kamoshita, Takashi, National Research Lab. of Metrology, Japan; Bulletin of the University of Electro-Communications; Dec. 1996; ISSN 0915-0935; Volume 9, No. 2, pp. 21-28; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

With error evaluation as the basis of education in instrumentation engineering, curriculum was made in error evaluation regarding the calibration measuring instruments through lectures and simple experiments. Since error evaluation would be important particularly when the true value was uncertain, readings were obtained of equally graduated scales as signals when measurements were made with a ruler, and errors were evaluated by determining the S/N ratio from the relationship between the graduation intervals and the readings. It was examined whether it would be possible to use Taguchi-Mahalanobis-System Method for predictively evaluating the measuring ability of the students with the results thus obtained in relation to a questionnaire survey of the students on their physical condition, characteristic propensity, etc. A defined plan was obtained nearly as desired.
Author
Measuring Instruments; Measurement; Education; Operators (Personnel)

19980219354 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems ***La Conception Integree des Compresseurs Multi-Etage a Haute Performance***
Sep. 1998; 156p; In English; Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems, 14-15 Sep. 1998, Lyon, Cologne, Cleveland, OH, France, Germany, USA; Sponsored by Research and Technology Organization, France; Also announced as 19980219355 through 19980219361; Original contains color illustrations
Report No.(s): RTO-EN-1; AC/323-(AVT)-TP/1; ISBN 92-837-1000-2; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

This Lecture Series covers the recent advances in the process of performing integrated design of high performance multistage compressors. The purpose is to broaden the compressor designer's understanding beyond traditional fluid dynamics to include the multidisciplinary systems approach required by modern gas turbine engines for longer life, lower acquisition and maintenance costs. The design process requires an optimization of the entire machine, which may be significantly different from the best aerodynamic design of each stage or blade row. In addition, many modern engines are simultaneously increasing compressor performance, and reducing machine length, which reinforces the fluid and structure interactions. Finally, in order to reduce both production and maintenance costs, manufacturing constraints have to be taken into account in the initial phase of the design process. The Lecture Series underlines the role of Computational Fluid Dynamics, as well as solid mechanics and vibration simulations. The need for compressor designs to consider and model mechanical interactions and manufacturing concerns will be a central focus. The subjects to be covered are: (1) Flow simulations with special emphasis on three-dimensional computations and on the stage stacking and interactions in multistage compressors; (2) Modelling the fluid structure interactions; and (3) First order manufacturing constraints and requirements.
Author
Multidisciplinary Design Optimization; Gas Turbine Engines; Turbocompressors; Computer Aided Design

32
COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. For related information see also 04 Aircraft Communications and Navigation and 17 Space Communications, Spacecraft Communications, Command and Tracking. For search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation.

19980221020 Federal Communications Commission, Office of Engineering and Technology, Washington, DC USA
Langley-Rice Methodology for Evaluating TV Coverage and Interference
Jul. 02, 1997; 26p; In English
Report No.(s): PB98-158314; OET/BULL-69; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Bulletin provides guidance on the implementation and use of Langley-Rice methodology for evaluating TV service coverage and interference in accordance with Sections 73.622, 73.623 and 74.704 of the FCC rules.
NTIS
Rice; Television Systems

19980221228 Helsinki Univ. of Technology, Lab. of Signal Processing and Computer Technology, Espoo, Finland
Laboratory of Signal Processing and Computer Technology, 1997 ***Annual Report***
1998; 46p; In English
Report No.(s): PB98-162662; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
The laboratory teaches and makes research in the areas of signal processing and digital hardware technology. Undergraduate education consists of computer technology and system level concepts of modern digital hardware design. Postgraduate education and research concentrate on digital signal processing and its implementation methods.
NTIS
Computer Systems Design; Signal Processing

19980221245 National Telecommunications and Information Administration, Washington, DC USA
Electromagnetic Compatibility Testing of a Dedicated Short-Range Communication System
Dalke, R. A., National Telecommunications and Information Administration, USA; Sanders, F. H., National Telecommunications and Information Administration, USA; Bedford, B. L., National Telecommunications and Information Administration, USA; Jul. 1997; 54p; In English
Report No.(s): PB98-164767; NTIA-98-352; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Dedicated short-range communication systems have been proposed for operation at locations across the USA in the 5850- to 5925-MHz band. Various search and tracking high-power radars operate at or near this frequency band and are a source of potential interference. The successful operation of such digital communication systems is dependent upon compatible operation and coexistence with these radars. The Institute for Telecommunication Sciences has performed a series of interference tests to determine the electromagnetic compatibility of DSRC systems used for automatic toll collection and high-power 5-GHz radars. The methods used to perform the tests and results are presented in this report.
NTIS
Electromagnetic Compatibility; Pulse Communication; Telecommunication; Transmission Efficiency; Radio Frequencies; Radar Transmission

19980221249 National Telecommunications and Information Administration, Boulder, CO USA
National Security and Emergency Preparedness Communications Experiments Using the Advanced Communications Technology Satellite
Kissick, W., National Telecommunications and Information Administration, USA; Sutherland, D., National Telecommunications and Information Administration, USA; Weibel, M., National Telecommunications and Information Administration, USA; McCoy, W., National Telecommunications and Information Administration, USA; Ruhl, M., National Telecommunications and Information Administration, USA; Aug. 1998; 98p; In English
Report No.(s): PB98-166655; NTIA-98-354; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
This report describes experimentation with an advance telecommunications satellite-the Advanced Communications Technology Satellite (ACTS) launched and operated by the National Aeronautics and Space Administration (NASA). The experimentation included measurements and analysis of the performance of several applications as well as investigation of protocol performance over the satellite channel.
NTIS
ACTS; NASA Programs; Satellite Communication; Communication Satellites; Telecommunication

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19980218958 Osaka City Univ., Faculty of Engineering, Japan
Application of a cooled CCD for amateur astronomers to alignment of an imaging polychromator
Mimura, Mikio, Osaka City Univ., Japan; Sasano, Tomohiko, Osaka City Univ., Japan; Kakeda, Toshihiko, Osaka City Univ., Japan; Ishiguro, Eiji, Ryukoku Univ., Japan; Sato, Kuninori, National Inst. for Fusion Science, Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 155-158; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

A cheap cooled CCD manufactured for amateur astronomers was used as the imaging detector of a soft X-ray polychromator for plasma spectroscopy. A computer program to control the CCD and to process its image data was developed using Turbo-C of PC9801 personal computer. Using this CCD system, rough alignment and adjustment of the soft X-ray polychromator was made.
Author
Charge Coupled Devices; Alignment; Imagery; X Ray Detectors; Spectroscopic Analysis; Instrument Orientation

19980219321 California Inst. of Tech., Pasadena, CA USA
Low-Loss NbTiN Films for THz SIS Mixer Tuning Circuits
Kooi, J. W., California Inst. of Tech., USA; Stern, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Chattopadhyay, G., California Inst. of Tech., USA; LeDuc, H. G., Jet Propulsion Lab., California Inst. of Tech., USA; Bumble, B., Jet Propulsion Lab., California Inst. of Tech., USA; Zmuidzinas, J., California Inst. of Tech., USA; 1998; 12p; In English
Contract(s)/Grant(s): NAGw-107; NAG5-4890; NAG2-1068; NSF AST-96-15025
Report No.(s): Rept-1998-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent results at 1 THz using normal-metal tuning circuits have shown that SIS mixers can work well up to twice the gap frequency of the junction material (niobium). However, the performance at 1 THz is limited by the substantial loss in the normal metal films. For better performance superconducting films with a higher gap frequency than niobium and with low RF loss are needed. Niobium nitride has long been considered a good candidate material, but typical NbN films suffer from high RF loss. to circumvent this problem we are currently investigating the RF loss in NbTiN films, a 15 K Tc compound superconductor, by incorporating them into quasi-optical slot antenna SIS devices.
Author
SIS (Superconductors); Superconducting Films; Niobium Compounds; Metal Films

19980219327 NASA Lewis Research Center, Cleveland, OH USA
Low Temperature Operation of a Three-Level Buck DC-DC Converter
Perez–Guerrero, Fausto F., Puerto Rico Univ., Puerto Rico; Ray, Biswajit, Puerto Rico Univ., Puerto Rico; Patterson, Richard L., NASA Lewis Research Center, USA; 1997; 6p; In English, 27 Jul. - 1 Aug. 1997, Honolulu, HI, USA; Sponsored by American Inst. of Chemical Engineers, USA
Contract(s)/Grant(s): NAG3-1944; RTOP 632-1A-1H
Report No.(s): Rept-97117; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The low temperature performance of a 50 kHz, 48 +/- 10 V/12 V, 60 W three-level pulse-width modulated (PWM) buck converter is reported. The converter was designed with standard commercially available components for operation from room temperature down to the liquid nitrogen temperature (-196 C). The measured efficiency was 89.12% at room temperature outside the chamber, and dropped to 87.27% at -195 C. Even at -195 C the converter was fully functional. The three-level converters, and in general multi-level converters, offer an attractive topology for high voltage applications.
Author
Low Temperature; Voltage Converters (DC to DC); Design Analysis; Fabrication

19980220266 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Observation of Current Contraction on Metallic-Graphite Brushes and Evaluation of Their Critical Current Densities by Thermal Shock Tests
Kurumada, Akira, Ibaraki Univ., Japan; Sato, Sennosuke, Ibaraki Univ., Japan; Sakai, Naotaka, Ibaraki Univ., Japan; Iwai, Maanori, Ibaraki Univ., Japan; Takahashi, Miyoshi, Hitachi Ltd., Japan; Yamashita, Nobuyuki, Hitachi Ltd., Japan; Journal of the Faculty

of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 83-92; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A brush used in an electric machine collects electric current so large and concentrated on the contact sliding surface that localized heat is generated on the surface. It brings about wear and roughening of the brush due to a number of complex factors. In our previous paper, particular attention was paid to current contraction that was found to occur locally on the contact surface between a brush and a commutator. An attempt was then made to determine the critical current densities that could cause the thermal stress fractures at the center and the periphery of the locally heated area on the sliding surface of the brush. In this paper, we discuss in detail the current contraction phenomena that were observed on the contact surfaces of metallic-graphite brushes and the commutator. We first measured quantitatively the current contraction areas on the brushes. Thermal shock resistances and fracture toughness of the four kinds of metallic-graphite brush materials were then measured. The critical current densities for the brushes were calculated using the measured thermal shock parameters and the ratio of the current contraction areas. These critical current densities indicate good agreement with the practical maximum current densities.

Author

Electric Current; Brushes; Graphite; Metals; Thermal Shock; Shock Tests; Current Density

19980220274 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

Realization of Subblock Circuit Using a Current Conveyor

Tomita, Yasushi, Ibaraki Univ., Japan; Ikeda, Katsuji, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 5-9; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper describes a realization of the subblock circuit (SB) for the biquadratic filter, which consists of using the second generation current conveyor (CC II) as the current inverting negative impedance converter and four passive RC elements. They can synthesize low-pass, band-pass, high pass, all pass, and band-elimination filtering functions with the SB connected to the three input differential circuit. The center frequency omega(sub 0) of the proposed filters are insensitive to the current tracking error of the CC II. A limited operational frequency is calculated to evaluate the circuit performance.

Author

Circuits; Electric Filters; Electronic Equipment Tests

19980220360 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

A Realization Method of Active Band Elimination Filter Using a Three-port D-R Mutator

Ikeda, Katsuji, Ibaraki Univ., Japan; Tomita, Yasushi, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 1-4; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A new band elimination filter using a three-port D-R mutator, which is suitable for a simulation of a floating frequency dependent negative conductance, is proposed. If two resistances in the proposed circuit are taken to be different values, low-pass and high-pass notch filters also can be realized.

Author

Bandstop Filters; Negative Conductance; Simulation

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FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19980219004 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

On the Propagation of Small Perturbations in Two Simple Aeroelastic Systems *Final Report*

Iollo, Angelo, Politecnico di Torino, Italy; Salas, Manuel D., Institute for Computer Applications in Science and Engineering, USA; Jul. 1998; 12p; In English

Contract(s)/Grant(s): NAS1-19480; NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-1998-208457; NAS 1.26:208457; ICASE-98-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we investigate the wave propagation patterns for two simple flow-structure problems. We focus on the study of the propagation speeds of the waves in the fluid and in the structure, as the rigidity of the structure and the Mach number of

the undisturbed flow are changing. Some implications concerning the sound emission by inhomogeneities eventually present in the structure are discussed.
Author
Aeroelasticity; Wave Propagation; Aerodynamic Characteristics; Aerodynamic Forces; Mach Number; Acoustic Emission

19980219033 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Some Remarks Concerning Recent Work on Rotating Turbulence ***Final Report***
Zhou, Ye, Institute for Computer Applications in Science and Engineering, USA; Speziale, Charles G., Boston Univ., USA; Rubinstein, Robert, Institute for Computer Applications in Science and Engineering, USA; Jul. 1998; 8p; In English
Contract(s)/Grant(s): NAS1-97046; N00014-94-1-0088; RTOP 505-90-52-01
Report No.(s): NASA/CR-1998-208449; NAS 1.26:208449; ICASE-98-29; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A recent paper on rotating turbulence by Canuto and Dubovikov is examined from both an historical and scientific perspective. It is first shown that their claim of finding a new energy spectrum scaling is inaccurate; such a scaling law has been published in the literature by other authors using the same physical assumptions. Canuto and Dubovikov actually only offered a different estimate for the constant. Finally, it is demonstrated that the alternative model for the dissipation rate transport equation proposed by Canuto and Dubovikov does not have the desired physical features in rotating isotropic turbulence. It is physically inconsistent in both the weak and strong rotation limits.
Author
Turbulence; Turbulence Models; Rotation; Isotropic Turbulence

19980219309 NASA Lewis Research Center, Cleveland, OH USA
A 3D Euler/Navier-Stokes Aeroelastic Code for Propulsion Applications
Bakhle, Milind A., Toledo Univ., USA; Srivastava, Rakesh, Toledo Univ., USA; Keith, Theo G., Jr., Toledo Univ., USA; Stefko, George L., NASA Lewis Research Center, USA; 1997; 8p; In English; 33rd; Propulsion, 6-9 Jul. 1997, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-1803; RTOP 538-06-1B; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This paper describes the development and verification of an aeroelastic code (TURBO-AE) based on an Euler / Navier-Stokes unsteady aerodynamic code (TURBO). The aeroelastic formulation is described. The modeling of the dynamics of the blade using a modal approach is detailed, along with the grid deformation approach used to model the elastic deformation of the blade. The work-per-cycle approach used to evaluate aeroelastic stability is described. Representative results for a test configuration used to verify the code are presented. Results are presented for both zero and non-zero interblade phase angles. The paper concludes with an evaluation of the development thus far, and some plans for further development and validation of the TURBO-AE code.
Author
Three Dimensional Models; Computer Programs; Proving; Navier-Stokes Equation; Aeroelasticity

19980219310 NYMA, Inc., Cleveland, OH USA
Instabilities Around a Bubble Due to Combined Marangoni and Buoyancy Effects
Rashidnia, Nasser, NYMA, Inc., USA; 1996; 10p; In English; Heat Transfer, 3-5 Aug. 1996, Houston, TX, USA; Sponsored by New Mexico Univ., USA
Contract(s)/Grant(s): NAS3-27186; RTOP 963-25-0C; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Study of themocapillary induced motions near bubbles attached to a heated wall in conjunction with the space experiments has received considerable attention in recent years. We present results of preliminary 1-G experimental observations which have indicated that when the Marangoni number (which includes the effects of the bubble shape factor) is increased beyond a critical value, a series of oscillatory flows develop in the vicinity of the bubble. This critical Marangoni number can be achieved by increasing either the temperature gradient near the interface in the bulk liquid or enlarge the bubble size. 'ne steady state flow and thermal fields surrounding the bubble are experimentally demonstrated. The transition to oscillatory flow by use of optical techniques is demonstrated. The oscillations have been detected in both the basic flow and temperature fields induced by combined Marangoni and buoyancy effects. A laser sheet for tracing particles, and interferometers for temperature fields were used to visualize these phenomena. Bubble interface oscillations were not detected. The influence of the Marangoni and Prandtl numbers and bubble geometry on the oscillations are indicated.
Author
Flow Distribution; Capillary Flow; Transition Flow; Temperature Distribution; Marangoni Convection; Spaceborne Experiments

19980219348 Massachusetts Inst. of Tech., Dept. of Mechanical Engineering, Cambridge, MA USA

A Posteriori Bounds for Linear-Functional Outputs of Crouzeix-Raviart Finite Element Discretizations of the Incompressible Stokes Problem ***Final Report***

Patera, Anthony T., Massachusetts Inst. of Tech., USA; Paraschivoiu, Marius, Massachusetts Inst. of Tech., USA; Mar. 09, 1998; 28p; In English

Contract(s)/Grant(s): NCC3-438; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present a finite element technique for the efficient generation of lower and upper bounds to outputs which are linear functionals of the solutions to the incompressible Stokes equations in two space dimensions; the finite element discretization is effected by Crouzeix-Raviart elements, the discontinuous pressure approximation of which is central to our approach. The bounds are based upon the construction of an augmented Lagrangian: the objective is a quadratic ”energy” reformulation of the desired output; the constraints are the finite element equilibrium equations (including the incompressibility constraint), and the intersubdomain continuity conditions on velocity. Appeal to the dual max-min problem for appropriately chosen candidate Lagrange multipliers then yields inexpensive bounds for the output associated with a fine-mesh discretization; the Lagrange multipliers are generated by exploiting an associated coarse-mesh approximation. In addition to the requisite coarse-mesh calculations, the bound technique requires solution only of local subdomain Stokes problems on the fine-mesh. The method is illustrated for the Stokes equations, in which the outputs of interest are the flowrate past, and the lift force on, a body immersed in a channel.

Author

Computational Grids; Equilibrium Equations; Functionals; Lagrange Multipliers

19980221277 NASA Lewis Research Center, Cleveland, OH USA

Density Relaxation of Liquid-Vapor Critical Fluids in Earth’s Gravity

Wilkinson, R. Allen, NASA Lewis Research Center, USA; 1997; 16p; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Experimental results of the density relaxation of a liquid-vapor critical fluid in earth’s gravity over a temperature regime of severe density stratification are presented. A dime-shaped sample of SF6 was placed in a Twyman-Green phase shifting interferometer with a phase uncertainty of lambda/65 over 60 hours. Relaxations to equilibrium stratification were observed for a temperature range from Tc + 1.0 mK to Tc + 29.6 mK, where Tc is the critical temperature. The interferometry provided density data as a continuous function of height and time over the full extent of the sample cell. Two types of initial density states were established before stepping to the final temperature (density) states for relaxation: (1) the two phase state at Tc - 50 mK, and (2) the equilibrium state at Tc + 100 mK. Upper and lower portions of the cell relaxed differently for these two initial states. For the Tc + 100 mK initial state, relaxation to T less than Tc + 3 mK showed a density overshoot followed by an additional long-time relaxation not seen in the other relaxation sequences. Otherwise, relaxations were faster and non-diffusive as the final state became closer to the critical temperature.

Author

Liquid-Vapor Interfaces; Experimentation; Diffusivity; Earth Gravitation; Sulfur Hexafluoride; Critical Point

19980221278 NASA Lewis Research Center, Cleveland, OH USA

Capillary Flow in an Interior Corner

Weislogel, Mark M., NASA Lewis Research Center, USA; Lichter, Seth, Northwestern Univ., USA; Journal of Fluid Mechanics; 1997; ISSN 0022-1120; 78p; In English

Contract(s)/Grant(s): N00014-92-1-1137; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The design of fluids management processes in the low-gravity environment of space requires an accurate model and description of capillarity-controlled flow in containers. Here we consider the spontaneous redistribution of fluid along an interior corner of a container due to capillary forces. The analytical portion of the work presents an asymptotic formulation in the limit of a slender fluid column, slight surface curvature along the flow direction z, small inertia, and low gravity. The scaling introduced here consumes much of the variation of flow resistance due to geometry and so the effects of corner geometry can be distinguished from those of surface curvature. New similarity solutions are found for which the length of the fluid column L(t)(tip location) increases with t(exp l/2) for a constant height boundary condition, t(exp 2/5) for a constant volume condition, and t(exp 3/5) for a constant inlet flow condition. In terms of the similarity parameter, the interface profile of all solutions is asymptotically the same in the region of the tip of the fluid column. A formulation is also presented which applies throughout the container (not just in the corner) in the limit of long times. Numerical computation of the interface profile is made accurate and efficient through the use of an invari-

ant transformation which removes the need for iteration and permits a single-step procedure. In the experimental portion of the work, measurements from a 2.2s drop tower are reported for the problem of capillary rise after a step reduction in gravity.
Derived from text
Capillary Flow; Corners; Flow Resistance; Experiment Design

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Aircraft Instrumentation, and 19 Space Instrumentation.

19980218950 Osaka City Univ., Dept. of Electrical Engineering, Japan
Extracting three-dimensional information with complex amplitude - Pattern matching using a holographic method
Yamada, Kenji, Osaka City Univ., Japan; Takahashi, Hideya, Osaka City Univ., Japan; Shimizu, Eiji, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 7-14; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

We worked on a method for extracting three-dimensional information from holographic interference fringe patterns by using an interferometer. So far, we identified the matching method by using the sum of products and the method that used an optical correlation system, we made a lot of masks for the depth direction and had to exchange them. In the work described in this paper, we used only one mask as complex amplitude distribution instead of the amplitude distribution. Here we present the method that extracts three-dimensional information by sifting the plane of observation phase information data with the improved optical correlation system.
Author
Images; Holography; Three Dimensional Models; Image Correlators; Image Processing; Imaging Techniques; Optical Correlators; Pattern Registration

19980218959 Osaka City Univ., Dept. of Information and Communication Engineering, Japan
Estimating the motion parameters of a moving camera from perspective image sequences
Sein, Myint Myint, Osaka City Univ., Japan; Hama, Hiromitsu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 159-163; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

This paper describes the results of some experiments on estimating the motion parameters of a moving camera from two or more consecutive image frames. Our method is based on the image sequences of a scene taken from different positions and orientations using a digital still camera in static environment. We extract the motion information about the scene and camera from two image sequences of a scene by perspective transformation. Experimental results with real images are presented.
Author
Cameras; Motion; Images; Estimating; Image Analysis

19980218961 Osaka City Univ., Dept. of Information and Communication Engineering, Japan
The 3-D box method for recovering shapes of 3-D objects from multi-images
Alam, Jahangir, Osaka City Univ., Japan; Yanagihara, Yoshio, Osaka City Univ., Japan; Hama, Hiromitsu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 171-174; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

One of important-tasks in computer vision is to determine the three-dimensional shapes of objects given different views (images) of the object scene. Here we want to propose a new method for recovering shapes of 3-D objects from multi-projected images. It is based on the concept of voting box and counting the votes for different images. Assuming a point in a scene has been correctly identified in each image, its three-dimensional position can be recovered via a simple ray tracing and counting votes which is called here as a 3-D box method. The main advantages of this method are simplicity, reliability, and less computational time. These advantages will make surely the 3-D box method of practical use for many applications.
Author
Computer Vision; Images; Three Dimensional Bodies; Image Analysis

19980219250 NASA, Washington, DC USA

Requesting AVIRIS Data: A Guide for Principal Investigators

Jun. 02, 1997; 8p; In English

Report No.(s): AD-A349652; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This guide serves as a brief overview of the AVIRIS instrument and its role in the field of imaging spectrometry. Mission planning and flight operations are discussed, and recommendations are given regarding the deployment of ground truth experiments.

DTIC

Imaging Techniques; Mission Planning; Flight Operations; Infrared Spectroscopy; Infrared Imagery

19980219478 Aerojet-General Corp., Azusa, CA USA

Integrated Advanced Microwave Sounding Unit-A (AMSU-A): METSAT A2 Signal Processor Engineering Test Report (P/N: 1331120-2, S/N: F02) ***Final Report***

Luu, D., Aerojet-General Corp., USA; Jun. 08, 1998; 25p; In English

Contract(s)/Grant(s): NAS5-32314

Report No.(s): AEROJET-11159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the METSAT A2 Signal Processor Engineering Test Report (P/N 1331120-2, S/N F02 for the Integrated Advanced Microwave Sounding Unit-A (AMSL)-A).

Author

Signal Processing; Performance Tests

19980220547 Helsinki Univ. of Technology, Metrology Research Inst., Espoo, Finland

A New Method for Characterization of Filter Radiometers

Toivanen, Pasi, Helsinki Univ. of Technology, Finland; Lassila, Antti, Helsinki Univ. of Technology, Finland; Manoochehri, Farshid, Helsinki Univ. of Technology, Finland; Kaerhae, Petri, Helsinki Univ. of Technology, Finland; Ikonen, Eekki, Helsinki Univ. of Technology, Finland; 1998; ISSN 1237-3281; 14p; In English

Report No.(s): PB98-161052; MRI-12/98; ISBN 951-22-4083-1; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors have developed a new method for characterization of irradiance responsivity of filter radiometers. The method is based on a spatially uniform, known irradiance, generated by combining several identical laser beams. The measurement set-up and the experimental demonstration at one wavelength are presented. The diffraction correction related to the generated irradiance is studied experimentally. The diffraction correction related to the generated irradiance is studied experimentally. The uncertainty analysis of the method indicates a relative standard uncertainty of 7 x 10(exp -4). The results obtained with the new method are compared with the characterization measurements based on the authors' present spectral irradiance scale. The results have a relative deviation of 3 x 10(exp -4), which is within the combined standard uncertainty of the comparison.

NTIS

Radiometers; Transmittance; Characterization

19980221019 Library of Congress, Washington, DC USA

Television and Video Preservation 1997: A Study of the Current State of American Television and Video Preservation, Volume 5, Submissions

Oct. 1997; 578p; In English

Report No.(s): PB98-158660; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

In 1994, ABC began construction of a 2000 sq. ft. video tape center to be dedicated to the restoration and preservation of the company's oldest video tapes. Known as the Media Conservation Facility, or MCF, the facility will comprise two operations, a Screening Center for the viewing of tapes to determine if the complete tape is to be preserved, or if sub-segments of the whole are to be kept. The other operation is the Dub Center, comprising various facilities dedicated to physical and electrical restoration of the tapes and the recording to new stock.

NTIS

Conservation; Television Systems; Video Tapes

19980221275 NASA Lewis Research Center, Cleveland, OH USA

The Annealing Effects on Electronic and Interface Properties of Pd/6H-SiC Schottky Diode Gas Sensors

Chen, Liang–Yu, NYMA, Inc., USA; Hunter, Gary W., NYMA, Inc., USA; Neudeck, Philip G., NYMA, Inc., USA; Bansal, Gaurav, NYMA, Inc., USA; Petit, Jeremy B., NYMA, Inc., USA; Knight, Dak, Cortez 3 Service Corp., USA; 1996; 38p; In English; 3rd; High Temperature Electronics, 9-14 Jun. 1996, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Schottky diodes composed of a thin palladium (Pd) film on silicon carbide (SiC) semiconductor substrate (Pd/SiC) detect hydrogen and hydrocarbons at elevated temperatures with high sensitivity. In order to determine the effect of extended annealing on the diode properties, the diodes were annealed at 425 C for up to 140 hours. The annealing significantly affected the diode's capacitive characteristics but the diode's forward current-carrying characteristics were comparatively stable exhibiting a strong response to hydrogen after annealing. Scanning Electron Microscopy studies of the surface of the Pd contact area of an annealed sample showed bubble-shaped structures. Relatively fine, dense grain structures with sharp contrast were present in both bubble and background areas. Energy Dispersive X-ray Spectroscopy measurements indicated that the palladium concentration was higher (silicon concentration lower) in the bright grain regions with respect to the dark background. Auger Electron Spectroscopy studies suggested that Si had migrated to the Pd surface from surrounding SiC surface through quasi two-dimensional diffusion along the surface which was activated by annealing. The annealing also significantly promoted interfacial diffusion and reaction at the interface between the Pd film and SiC substrate so that the interface region broadened. The major interfacial products were palladium silicides. These observations of changes in surface and interface structures help explain the effects of long term annealing on electronic properties of the diode. This work shows that Pd and SiC based Schottky diodes have significant potential as high temperature gas sensors, but stabilization of the structure is necessary to insure their repeatability in long-term, high temperature environments.

Author

Annealing; Electronic Equipment; Interface Stability; Gas Detectors; Palladium; Schottky Diodes; Semiconducting Films

37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19980219326 NASA Lewis Research Center, Cleveland, OH USA

The Numerical Propulsion System Simulation: Concept to Product

Lytle, John K., NASA Lewis Research Center, USA; 1997; 7p; In English; Air Breathing Engines, 7-11 Sep. 1997, Chattanoga, TN, USA; Meeting sponsored by International Society for Air Breathing Engines

Contract(s)/Grant(s): RTOP 509-10-11; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The technologies necessary to enable numerical simulations of complete air-breathing gas turbine engines is being developed at the NASA Lewis Research Center in cooperation with industry, academia and other government agencies. Large scale, detailed simulations will be of great value to industry if they eliminate some of the costly testing required to develop and certify engines. In addition, time and cost savings will be achieved by enabling design details to be evaluated early in the development process before a commitment is made to a specific design. This concept has become a project called the Numerical Propulsion System Simulation (NPSS). NPSS consists of three main elements: 1. engineering models that enable multidisciplinary analysis of large subsystems and systems at various levels of detail, 2. a simulation environment that maximizes designer productivity and 3. a cost-effective, high-performance computing platform. A fundamental requirement of the project is that the simulations must be capable of overnight execution on easily accessible computing platforms. The paper will describe the technologies being developed for NPSS and will highlight current capabilities which include 3-D aerodynamic simulations of complex components such as a multistage compressor and of large subsystems such as the low pressure subsystem in a turbofan engine.

Author

Technologies; Propulsion; Numerical Analysis; Gas Turbine Engines; Cost Effectiveness; Air Breathing Engines

19980219330 NASA Lewis Research Center, Cleveland, OH USA

Feasibility Assessment of Thermal Barrier Seals for Extreme Transient Temperatures

Steinetz, Bruce M., NASA Lewis Research Center, USA; Dunlap, Patrick H., Jr., Modern Technologies Corp., USA; Jul. 1998; 18p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 523-53-13

Report No.(s): NASA/TM-1998-208484; E-11196; NAS 1.15:208484; AIAA Paper 98-3288; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The assembly joints of modem solid rocket motor cases are generally sealed using conventional O-ring type seals. The 5500+ F combustion gases produced by rocket motors are kept a safe distance away from the seals by thick layers of phenolic insulation. Special compounds are used to fill insulation gaps leading up to the seals to prevent a direct flowpath to them. Design criteria require that the seals should not experience torching or charring during operation, or their sealing ability would be compromised. On limited occasions, NASA has observed charring of the primary O-rings of the Space Shuttle solid rocket nozzle assembly joints due to parasitic leakage paths opening up in the gap-fill compounds during rocket operation. NASA is investigating different approaches for preventing torching or charring of the primary O-rings. One approach is to implement a braided rope seal upstream of the primary O-ring to serve as a thermal barrier that prevents the hot gases from impinging on the O-ring seals. This paper presents flow, resiliency, and thermal resistance for several types of NASA rope seals braided out of carbon fibers. Burn tests were performed to determine the time to burn through each of the seals when exposed to the flame of an oxyacetylene torch (5500 F), representative of the 5500 F solid rocket motor combustion temperatures. Rope seals braided out of carbon fibers endured the flame for over six minutes, three times longer than solid rocket motor burn time. Room and high temperature flow tests are presented for the carbon seals for different amounts of linear compression. Room temperature compression tests were performed to assess seal resiliency and unit preloads as a function of compression. The thermal barrier seal was tested in a subscale ”char” motor test in which the seal sealed an intentional defect in the gap insulation. Temperature measurements indicated that the seal blocked 2500 F combustion gases on the upstream side with very little temperature rise on the downstream side.

Author

Feasibility Analysis; Thermal Resistance; Sealing; High Temperature Gases; O Ring Seals; Rocket Nozzles

19980219355 Ecole Centrale de Lyon, Fluid Mechanics and Acoustic Lab., Ecully, France

Integrated Design of High Pressure Multistage Engines Systemes: An Overview

Leboeuf, Francis, Ecole Centrale de Lyon, France; Integrated Multidisciplinary Design of High Pressure Multistage Compressor Systems; Sep. 1998; 6p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The gas turbine design associates very different engineering sciences, including aerodynamic, combustion, structure and mechanical systems, and materials. Engines operate close to their limits of mechanical stability, with the help of electronic control systems. Extensive uses of simulation tools have enabled impressive improvements of performance and reliability. Simultaneously, the designers now put their efforts on the global reduction of costs, such as the development and production costs, the maintenance, repair and disposal costs. The present design approach must include the concept of affordability of technological and financial resources.

Author

Gas Turbine Engines; Turbocompressors; Design to Cost; Multidisciplinary Design Optimization; Engine Design

19980219356 Technische Univ. Munich, Garching, Germany

The Multidisciplinary Design Process

Kau, H.–P., Technische Univ. Munich, Germany; Sep. 1998; 16p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The complexity of the business process for multistage compressors is similar to that of complete aeroengines or propulsion systems and recent experience can be read across. Special attention is given to the description of the elements of the design process. Based on the necessity for a multidisciplinary approach a design team structure for simultaneous engineering is proposed. Some examples for typical tasks to be solved during the design process illustrate the advantage of an interactive multidisciplinary design and development.

Author

Multidisciplinary Design Optimization; Turbocompressors; Aircraft Engines; Systems Integration

19980219357 Societe Nationale d’Etude et de Construction de Moteurs d’Aviation, Compressor Aerodynamics Dept., Moissy-Cramayel, France

Recent Advances in Compressor Aerodynamic Design and Analysis

Escuret, J. F., Societe Nationale d’Etude et de Construction de Moteurs d’Aviation, France; Nicoud, D., Societe Nationale d’Etude et de Construction de Moteurs d’Aviation, France; Veysseyre, P., Societe Nationale d’Etude et de Construction de Moteurs d’Aviation, France; Sep. 1998; 23p; In English; Also announced as 19980219354; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Advances in Computational Fluid Dynamics (CFD) remain a significant source of improvements in the design process of aero-engine fans and compressors, leading to higher performance, cost and design cycle reductions as well as lower associated risks. This paper illustrates the continued integration of CFD tools at SNECMA with a description of the latest developments in compressor aerodynamic design and analysis methods. Three directions of research are currently being pursued. Firstly, the numerical models are constantly improved to take into consideration problems as close as possible to the reality. This means in particular that turbulence models more representative of the real complex flows are introduced. Although it remains very incomplete so far, some unsteady effects are simulated. Also, the description of the compressor geometry is both refined, taking into account various technological effects (i.e. tip clearance; flowpath discontinuity; radius fillets), and extended to the simulation of multiple blade rows. The integration of new CFD tools with improved simulation capabilities requires a permanent update of the design methodology. Secondly, a great effort is currently devoted to adapting the computing environment to the designer needs as it impacts both the quality and the overall duration of the design process. At SNECMA, this approach takes the form of a specifically tailored software environment in order to provide the designer ready to use tools, enabling him to fully exploit the potential of the methods and to focus primarily on the physical analysis of the results. Finally, the most refined CFD tools present only a limited interest to the compressor designer unless they have been extensively validated on significant experimental test cases. This implies that an appropriate validation database representative of real engine flows be acquired. All these aspects of CFD are illustrated in the paper using practical examples supported by both numerical and experimental results. Finally, the prospects of new developments are discussed.

Author

Computational Fluid Dynamics; Turbulence Models; Computerized Simulation; Compressors; Aircraft Engines; Design Analysis; Multidisciplinary Design Optimization

19980219358 General Electric Co., Aircraft Engines, Cincinnati, OH USA

First Order Manufacturing Constraints and Requirements

Bailey, Michael W., General Electric Co., USA; Steinmetz, Gregory T., General Electric Co., USA; Kielb, Robert E., General Electric Co., USA; Long, Loren L., General Electric Co., USA; Herbert, Jeffrey G., General Electric Co., USA; Vishnauski, Jon M., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The purpose of this section of the lecture series is to discuss first order manufacturing constraints not only in the context of manufacturing, process and producability but their relevance to system considerations of performance, cost and operability. In every design there exists a performance ceiling and a cost floor between which multiple solutions exist. The purpose of a design is to create a product that will provide customer satisfaction in terms of expectations or technical requirements. In the military world this is the ability complete a specific mission and in the commercial world this is the ability to produce a revenue stream. The challenge is to translate these customer Critical to Quality (CTQ) requirements into hardware that will comprise a system. Consequently an understanding of the flowdown of the customer CTQ's to individual parts is essential if customer satisfaction is to be achieved. This represents the challenge in GEAE's Design For Six Sigma (DFSS) initiative and is driving the shift from deterministic to probabilistic design methodologies.

Author

Manufacturing; Structural Analysis; Structural Design; Structural Design Criteria; Aerodynamics; Compressors

19980219359 Technische Univ. Munich, Garching, Germany

Compressor Matching and Designing for Tip Clearance

Kau, H.–P., Technische Univ. Munich, Germany; Sep. 1998; 18p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

Compressors are designed for a specific duty reflected in the thermodynamic performance target, for design goals and for overall items in the specification, e.g. geometric dimensions, weight and cost. Early in the design phase general decisions need to be taken which, based on the technology level of the designing company decide on the degree of challenge and thus the risk of the whole project. For best performance, the most important early decision is the level of stage loading and its distribution throughout the compressor. Together with the definition of the available cross section in each axial position, this determines the stagewise matching. This lecture firstly describes the general rules of matching multistage compressors and secondly, from a design point of view, discusses one of the most important parameters influencing the matching during steady operation but even more significantly during transient operation, the design of tip clearance.

Author

Turbocompressors; Clearances; Tolerances (Mechanics); Blade Tips; Multidisciplinary Design Optimization; Computer Aided Design

19980219360 General Electric Co., Aircraft Engines, Cincinnati, OH USA

First Order Manufacturing Constraints and Requirements: Design to Cost and Manufacturing Process Considerations

Long, Loren L., General Electric Co., USA; Bailey, Michael W., General Electric Co., USA; Herbert, Jeffrey G., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this session of the lecture series we will discuss the impact of cost as a design parameter. Historically in aircraft engine design up until the beginning of 1990, technology drove the design and cost was merely a resultant. With the end of the Cold War and the unprecedented airline losses in the early 1990's, cost shifted from being merely a resultant to a design parameter comparable with weight, specific fuel consumption and thrust. If we define Manufacturing Cost + Contribution Margin = Sell Price and Contribution Margin - Fixed Cost = Operating Margin, downward pressure on price from the customer and the need to maintain operating margin for the shareholders leaves manufacturing and fixed costs as the only variables. The effects of this were felt, not only in the manufacturing area, but also in engineering with the resulting trend to move to more technologically conservative robust designs.

Derived from text

Design to Cost; Engine Design; Aircraft Engines; Design Analysis; Cost Analysis; Manufacturing; Concurrent Engineering

19980219361 General Electric Co., Aircraft Engines, Cincinnati, OH USA

First Order Manufacturing Constraints and Requirements: Common Geometry and Multidisciplinary Design and Optimization

Bailey, Michael W., General Electric Co., USA; Vishnauski, Jon M., General Electric Co., USA; Sep. 1998; 28p; In English; Also announced as 19980219354; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this session we will discuss future developments. A key area is the concept of common geometry or master model. There are many definitions of a Master Model. At GEAE the definition is a single geometric representation, ideally 3-D, created at concept using feature based parametric modeling techniques in a linked associative environment. In addition there would be a tight integration of all elements of a product creation, manufacturing and support permitting true concurrency for analysis and manufacturing since updates can be flowed down to the individual activities from the Master Model. An additional requirement is the management of all types of data or metadata within the common geometry environment. Historically, analysis codes were coupled together with input and output files with geometry provided as an output as necessary, probably in the form of an IGES file. The new approach is to have geometry central or common to all the processes and use geometry as a design integrator. This would facilitate CAD integration with analysis and CAD integration with manufacturing.

Author

Multidisciplinary Design Optimization; Computer Aided Design; Descriptive Geometry; Design Analysis; Computer Aided Manufacturing; Three Dimensional Models; Aircraft Engines

19980220261 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

A Study on Pre-Ignition in Small Tow-Stroke Cycle Methanol Engines

Sawa, Norihiro, Ibaraki Univ., Japan; Hori, Shozo, Ibaraki Univ., Japan; Inoue, Yoshihiro, Ibaraki Univ., Japan; Hara, Shoji, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 145-155; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

When methanol was used as an alternative fuel in a two cycle spark ignition engine, the pre-ignition occurred at high compression ratio. This pre-ignition may be caused by the defect of easy ignitability on hot surface, and this is an uncomfortable problem. Therefore, we investigated the effect of the following various engine's parameters on the combustion state. These parameters are effective compression ratio, ignition timing, heat range of spark plug, throttle valve opening, cooling air amount, engine speed and hydrous methanol. In the result, it has been found that pre-ignition can appreciably be avoided by various engine's parameters such as deterioration of compression ratio, delayed ignition timing, spark plug of higher heat range, and hydrous methanol fuel.

Author

Methyl Alcohol; Piston Engines; Engine Design; Spark Ignition

19980220262 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

Finite Element Simulation Systems for Metal Machining, Report 3, Extension from Two-Dimensional to Three-Dimensional Analysis

Maekawa, Katsuhiro, Ibaraki Univ., Japan; Maeda, Masafumi, Ibaraki Univ., Japan; Ohshima, Ikuya, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 131-144; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The development and implementation of a finite element method for the simulation of three-dimensional metal machining processes with a continuous chip are presented. A four-node, free overconstraint tetrahedral finite element is formulated. The effects of elasticity, plasticity, temperature, strain rate, large strain, friction, and wear are all included in the formulation combined with realistic flow properties of the workpiece and friction and wear characteristics of the cutting tool. The forces, temperature and chip configurations calculated for the oblique cutting of a 18% manganese steel with a P20 carbide tool are compared with experiments, showing good quantitative agreement. The three dimensional simulation also predicts the effects of cutting action by the front tool edge upon the cutting mechanism, such as the development of plastic deformation in the workpiece followed by the increase in temperature and severe tool wear near the edge.
Author
Finite Element Method; Three Dimensional Models; Computerized Simulation; Machining; Metal Cutting; Manganese Alloys; Carbides; Cutters

38
QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19980220161 NASA Langley Research Center, Hampton, VA USA
Low-Cost Quality Control and Nondestructive Evaluation Technologies for General Aviation Structures
Cramer, K. Elliott, NASA Langley Research Center, USA; Gavinsky, Bob, Stoddard-Hamilton Aircraft, Inc., USA; Semanskee, Grant, Stoddard-Hamilton Aircraft, Inc., USA; Jul. 1998; 14p; In English
Contract(s)/Grant(s): RTOP 538-07-12-01
Report No.(s): NASA/TM-1998-208456; L-17763; NAS 1.15:208456; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA's Advanced General Aviation Transport Experiments (AGATE) Program has as a goal to reduce the overall cost of producing private aviation aircraft while maintaining the safety of these aircraft. In order to successfully meet this goal, it is necessary to develop nondestructive inspection techniques which will facilitate the production of the materials used in these aircraft and assure the quality necessary to maintain airworthiness. This paper will discuss a particular class of general aviation materials and several nondestructive inspection techniques that have proven effective for making these inspections. Additionally, this paper will discuss the investigation and application of other commercially available quality control techniques applicable to these structures.
Author
Low Cost; Quality Control; Nondestructive Tests; Evaluation; Technology Assessment

39
STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19980218953 Osaka City Univ., Dept. of Architecture and Building Engineering, Japan
Tangent stiffness equations for laterally distributed loaded member
Taniguchi, Yoshiya, Osaka City Univ., Japan; Saka, Toshitsugu, Osaka City Univ., Japan; Tanaka, Hideto, Takenaka Corp., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 27-37; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Tangent stiffness equations for a beam-column which is subjected to either uniformly or sinusoidally distributed lateral load are presented. The equations have been derived by differentiating the slope-deflection equations under axial forces for a member. Then, the tangent stiffness equations take into account axial forces, a bowing effect and laterally distributed loads. Elastic buckling behavior of parallel chord latticed beams with laterally distributed loads is investigated, to compare the results of the present method with a conventional method in which the distributed loads are considered as concentrated loads at additional nodes of a member. Furthermore, buckling tests were carried out to confirm the derived equations and to make clear the buckling behavior

of space frame structures. As a result, the new equations can lead to a good efficiency of estimating equilibrium paths and a significant savings in the core storage and computing time required for the analysis of space frame structures.
Author
Structural Analysis; Elastic Buckling; Deflection; Stiffness; Loads (Forces); Frames; Structural Members; Load Distribution (Forces)

19980218954 Osaka City Univ., Dept. of Civil Engineering, Japan
Shear bond characteristics of embossed steel plates for an open sandwich type composite beam
Kitoh, Hiroaki, Osaka City Univ., Japan; Uenaka, Kojiro, Osaka City Univ., Japan; Sonoda, Keiichiro, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 63-71; In English; Also announced as 19980218948; Sponsored in part by Kozai Club in Japan; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

RILEM/CEB/FIP has proposed a standard shear bond test method of deformed steel bars with R/C beam. We developed herein a similar test of embossed steel plate for open sandwich beams. As the results of 30 specimens, the obtained failure modes and bond strengths were almost same as those from the direct pull-out test method that we previously proposed.
Author
Metal Plates; Steels; Deformation; Composite Structures; Construction; Shear Properties; Beams (Supports); Sandwich Structures

19980218956 Osaka City Univ., Dept. of Civil Engineering, Japan
Basic theory and numerical example for elasto-plastic and finite displacement analysis of stiffened plates with opening subjected to compression
Kitada, Toshiyuki, Osaka City Univ., Japan; Iwai, Yoshiharu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 131-146; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Described in this paper is a basic theory for elasto-plastic and finite displacement analysis of stiffened plates with the opening subjected to compression in consideration of the initial imperfections such as initial deflection and residual stress on the basis of a finite element method. In this theory, the geometrical nonlinearity caused by the large deflection of plates is formulated according to a total Lagrangian method of removing the rigid body displacement from the global deformation of a finite element, and then the yield condition of von Mises and the plastic flow rule of Prandtl-Reuss with strain hardening are used to simulate elasto-plastic nonlinear behavior of steel material. Unbalanced forces between true nodal forces and applied nodal forces in each step of the iteration calculation are eliminated by the Newton-Raphson's method. A short box column consisting of two mild steel stiffened plates with a circular hole in each of them and two high strength steel flange plates are analyzed as a numerical example. Moreover, these numerical results are compared with the experimental results corresponding to the short box column.
Author
Finite Element Method; High Strength Steels; Holes (Mechanics); Metal Plates; Nonlinear Systems; Plastic Flow; Rigid Structures; Deformation; Displacement; Flanges; Elastoplasticity; Compression Loads; Structural Analysis

19980220265 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Measurements of Dynamic Stresses in a Spur Gear by the Copper Electroplating
Imamura, Yoshio, Ibaraki Univ., Japan; Sato, Sennosuke, Ibaraki Univ., Japan; Takeuchi, Wataru, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 101-108; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In this paper, dynamic stresses in the tooth flank of a spur gear are measured during the power transmission gearing by means of the copper electroplating. The influences of manufacturing process, circumferential velocity, and error of the gear are quantitatively measured. Obtained results are as follows: (1) The stresses at the compression side in the root of gear teeth are different from the tension side. The flecking in compression side are more dense showing larger stresses than these of the tension side. (2) The positions of the maximum stress in the root of gear teeth are found to occur nearer the root, than 30 deg. tangential method hitherto proposed. (3) Influence of the circumferential velocity is similar to the equation of AGMA's in tendency.
Author
Gear Teeth; Stress Analysis; Copper; Electroplating; Stress Measurement; Manufacturing

19980220271 Ibaraki Univ., Hitachi, Japan

Earth Pressure Characteristics Against the Deep-Buried Underground Concrete Pipes

Fukuzawa, Kimio, Ibaraki Univ., Japan; Yasuhara, Kazuya, Ibaraki Univ., Japan; Sato, Ken–ichi, Ibaraki Univ., Japan; Hattori, Toshimitsu, Nakagawa Hume Pipe Industry Co. Ltd., Japan; Kitagawa, Akihiro, Penta-Ocean Construction Co. Ltd., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 29-39; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The aim of the present study is to investigate the characteristics of earth pressures acting on underground concrete pipes under one dimensional conditions. A number of model tests on a concrete pipe embedded in sand were carried out to investigate the effects of the installation method and the shape of the pipes on the earth pressures, using one-dimensional compression box-type model tests. The vertical pressure was applied through the surface of the sand (1800 mm deep and 1200 mm wide) under conditions of lateral confinement. The settlements of the sand as well as the earth pressures in the sand on and below the concrete pipe were measured during step loading in each tests. The following conclusions on the earth pressures on underground pipes in sand are derived from the results of model tests : (1) The earth pressures and strains were concentrated beneath the underground pipe when the vertical load was applied on the surface of sand; (2) Distribution of strains and earth pressures on underground pipes were different depending on their shape and method of installation; and (3) The best method to reduce the earth pressures is to bury the underground concrete pipe inclined at angle of 45 deg. from the vertical axis. The concentration of earth pressures on pipes can be avoided using this method of installation rather than using the regular method of installation.

Author

Concrete Structures; Pipes (Tubes); Pressure Effects; Underground Structures; Compression Tests

42
GEOSCIENCES (GENERAL)

19980220544 Geological Survey, Water Resources Div., Idaho Falls, ID USA

Distribution of Selected Radiochemical and Chemical Constituents in Perched Ground Water, Idaho National Engineering Laboratory, Idaho, 1989-1991

Tucker, Betty J., Geological Survey, USA; Orr, Brennon R., Geological Survey, USA; Jan. 1998; 74p; In English

Report No.(s): PB98-160534; USGS/WRI-98-4028; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents an analysis of water-level and water-quality data collected from selected wells completed in perched ground water at selected INEL facilities during 1989-91 as part of the continuing hydrogeologic investigation at the INEL. The report describes the distribution and concentration of selected radiochemical and chemical constituents in perched ground water at the Test Reactor Area (TRA), Idaho Chemical Processing Plant (ICPP), and Radioactive Waste Management Complex (RWMC).

NTIS

Ground Water; Radiochemistry; Chemical Composition

19980220545 Geological Survey, West Trenton, NJ USA

Analytical Methods, Numerical Modeling, and Monitoring Strategies for Evaluating the Effects of Ground-Water Withdrawals on Unconfined Aquifers in the New Jersey Coastal Plain

Modica, E., Geological Survey, USA; 1998; 80p; In English

Report No.(s): PB98-160559; USGS/WRI-98-4003; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Analytical and numerical solutions of ground-water withdrawals in the unconfined part of the Kirkwood-Cohansey aquifer system of the Coastal Plain of New Jersey were evaluated for their usefulness in predicting the area of influence of a pumped well and in determining hydraulic characteristics of an aquifer. Additionally, simulations of ground-water withdrawal using a finite-difference model provided information on the ways in which prudent well-location strategies can disperse the local effects of withdrawal over a large part of an aquifer system. The design of a monitoring network that is sensitive to the ground-water hydraulics of streams and wetlands of the Coastal Plain of New Jersey also was considered for its utility in providing hydrologic data necessary to establish the baseline hydrologic conditions near wetlands and streams and in signalling when ground-water levels are being adversely affected by withdrawals elsewhere in the system.

Author (NTIS)

Coastal Plains; Ground Water; Numerical Analysis; Mathematical Models; Aquifers

19980220546 Geological Survey, Water Resources Div., Honolulu, HI USA

Water Resources Data for Hawaii, Water Year 1997 ***Annual Report, 1 Oct. 1996 - 30 Sep. 1997***

Hill, Barry R., Geological Survey, USA; Taogoshi, Roy I., Geological Survey, USA; Kunishige, Vaughn E., Geological Survey, USA; Shibata, Wayne S., Geological Survey, USA; Jul. 21, 1998; 540p; In English

Report No.(s): PB98-160948; USGS/WDR/HI-97/1; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

Water resources data for the 1997 water year for Hawaii consist of records of stage, discharge, and water quality of streams and springs; and water levels and quality of water wells, including: water discharge for 80 gaging stations on streams, springs, and ditches; discharge data for 107 crest-stage partial-record stations and 16 miscellaneous sites; water-quality data for 7 streams, 28 partial-record stations, and 142 wells; water levels for 73 observation wells; rainfall data for 41 rainfall sections; and discharge data for 65 miscellaneous sites from water years 1993 through 1995.

NTIS

Water Resources; Surface Water; Ground Water; Hydrology; Tables (Data)

19980220549 Geological Survey, Water-Resources, Tallahassee, FL USA

Assessment of the Hydraulic Connection between Ground Water and the Peace River, West-Central Florida

Lewelling, B. R., Geological Survey, USA; Tihansky, A. B., Geological Survey, USA; Kindinger, J. L., Geological Survey, USA; 1998; 108p; In English

Report No.(s): PB98-161110; USGS/WRI-97-4211; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The hydraulic connection between the Peace River and the underlying aquifers along the length of the Peace River from Bartow to Arcadia was assessed to evaluate flow exchanges between these hydrologic systems. Methods included an evaluation of hydrologic and geologic records and seismic-reflection profiles, seepage investigations, and thermal infrared imagery interpretation.

NTIS

Ground Water; Seepage; Aquifers; Rivers

19980220550 Geological Survey, Fort Collins, CO USA

Water Quantity Model Development: 1997 Completion Report

Flug, Marshall, Geological Survey, USA; Scott, J., Geological Survey, USA; Nov. 10, 1997; 70p; In English

Report No.(s): PB98-161169; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A Water Quantity Model (WQM) was developed for the Klamath River Basin for assessing water quantity related management alternatives in the recovery and maintenance of threatened and endangered fish species in the basin. This WQM was primarily developed for the Technical Work Group of the Klamath River Basin Fisheries Task Force, who routinely interacted with and provided review and approval of each task in the modeling process. The WQM is a monthly water accounting computer model that simulates the operation of the river basin and reservoir system from Upper Klamath lake to the Seiad Valley USGS stream gage.

NTIS

River Basins; Geological Surveys; Water Management; Water Quality; Water

19980220551 Humboldt State Univ., Klamath Bioregional Assessment Project, Arcata, CA USA

Comparative Analysis of the Klamath River Basin Ecosystem: GIS and Technical Support for the Klamath River Basin Fisheries Task Force and Technical Work Group, Phase 3

Carlson, Steven A., Humboldt State Univ., USA; Neumeier, Kelly, Humboldt State Univ., USA; Sep. 1997; 58p; In English

Contract(s)/Grant(s): FWS-14-48-0001-95735

Report No.(s): PB98-161177; Rept-97-PC-01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Klamath River Basin Fisheries Task Force Technical Work Group (TWG) contracted with the Spatial Analysis Lab (SAL) at Humboldt State University, to assemble and develop Geographical Information System (GIS) digital data layers for fisheries restoration planning in the Klamath River Basin and to provide technical support for TWG activities including subbasin planning. Project funding was used to provide map layers and products, maintain the fishery restoration project database, and analyze digit map layers in cooperation with federal, state, Native American tribes and other entities involved with restoration efforts in the Klamath River Basin. The majority of GIS efforts lent support to subbasin planning and the continuing cooperative microhabitat and flow study (including water quantity and quality modeling) work between the USGS Midcontinent Ecological Science Center and the U.S. Fish and Wildlife Service. Products from the vegetation mapping of the Klamath Bioregion from LANDSAT

imagery that was completed by the Klamath Bioregional Assessment Project have been incorporated for spatial analysis that will assist the TWG examine parameters affecting anadromous fishery recovery efforts.
NTIS
Geographic Information Systems; Data Processing; Digital Data; Fisheries; Data Bases

19980221223 Geological Survey, Water Resources Div., Honolulu, HI USA
Ground Water in the Southern Lihue Basin, Kauai, Hawaii
Izuka, Scot K., Geological Survey, USA; Gingerich, Stephen B., Geological Survey, USA; 1998; 82p; In English
Report No.(s): PB98-158710; USGS/WRI-98-4031; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of the third phase of the USGS/Kauai DOW cooperative study was to obtain a comprehensive understanding of ground-water occurrence and movement in the southern Lihue Basin. The objective was met by incorporating the diverse data from previous phases and conducting additional data collection and analyses, including (1) analysis of ground-water discharge to streams using hydrograph-separation techniques and instantaneous discharge measurements, and (2) numerical ground-water modeling. This report describes the resulting understanding of the hydrogeologic system in the southern Lihue Basin.
NTIS
Ground Water; Geological Surveys

19980221226 Forest Service, Southern Research Station, Asheville, NC USA
An Interim Old-Growth Definition for Cypress-Tupelo Communities in the Southeast
Devall, Margaret S., Forest Service, USA; Jun. 1998; 18p; In English
Report No.(s): PB98-160286; FSGTR-SRS-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An interim definition of old-growth cypress-tupelo forests is presented to assist in management of these communities until comprehensive definitions based on research can be formulated. The basic criteria for identifying old-growth cypress-tupelo (Taxodium distichum--Nyssa aquatica) communities in the South are presented.
NTIS
Identifying; Trees (Plants)

19980221230 Forest Service, Rocky Mountain Research Station, Ogden, UT USA
Plant-Herbivore Interactions in Atriplex: Current State of Knowledge
Cibils, Andres F., Forest Service, USA; Swift, David M., Forest Service, USA; McArthur, E. Durant, Forest Service, USA; Aug. 1998; 42p; In English
Report No.(s): PB98-163496; RMRS-GTR-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Atriplex is a widespread genus with species dispersed over almost all continents. Many taxa within this genus perform outstandingly under a variety of stress conditions and are often an important source of forage for herbivores. Such attributes have drawn the attention of many researchers who have conducted extensive studies on Atriplex across a wide variety of environments and management scenarios. This report reviews much of the literature dealing with aspects of the biology of Atriplex form an animal-plant interaction perspective.
NTIS
Continents; Organisms; Ecology; Plants (Botany)

19980221253 Geological Survey, Water Resources Div., Montgomery, AL USA
Water Resources Data for Alabama, Water Year 1997 *Annual Report*
Pearman, J. L., Geological Survey, USA; Stricklin, V. E., Geological Survey, USA; Psinakis, W. L., Geological Survey, USA; Jun. 1998; 488p; In English
Report No.(s): PB98-164551; USGS/WDR/AL-97/1; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

This report includes records on both surface and ground water in the State. Specifically, it contains: (1) discharge records for 113 streamflow-gaging stations, for 29 partial-record or miscellaneous streamflow stations; (2) stage and contents records for 14 lakes and reservoirs and stage or elevation at 35 stations; (3) water-quality records for 15 streamflow-gaging stations, 1 lake station, for 27 ungaged streamsites, and for 1 precipitation station; (4) water temperature and specific conductance at 16 surface-water stations; (5) dissolved oxygen at 9 stations; (6) sediment data at 17 stations; and (7) water-level records at 1 recording observation well. Also included are lists of active and discontinued continuous-record surface-water discharge stations, continu-

ous-record surface-water stage stations, continuous record surface-water-quality stations, and partial-record and miscellaneous surface-water quality stations.
NTIS
Water Resources; Water Quality; Surface Water; Sediments; Ground Water; Water Temperature

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19980219483 Montana Univ., Missoula, MT USA
Pre-Launch Tasks Proposed in our Contract of December 1991 ***Semiannual Report***
Jul. 15, 1998; 28p; In English
Contract(s)/Grant(s): NAS5-31368; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We propose, during the pre-EOS phase to: (1) develop, with other MODIS Team Members, a means of discriminating different major biome types with NDVI and other AVHRR-based data; (2) develop a simple ecosystem process model for each of these biomes, BIOME-BGC; (3) relate the seasonal trend of weekly composite NDVI to vegetation phenology and temperature limits to develop a satellite defined growing season for vegetation; and (4) define physiologically based energy to mass conversion factors for carbon and water for each biome. Our final core at-launch product will be simplified, completely satellite driven biome specific models for net primary production. We will build these biome specific satellite driven algorithms using a family of simple ecosystem process models as calibration models, collectively called BIOME-BGC, and establish coordination with an existing network of ecological study sites in order to test and validate these products. Field datasets will then be available for both BIOME-BGC development and testing, use for algorithm developments of other MODIS Team Members, and ultimately be our first test point for MODIS land vegetation products upon launch. We will use field sites from the National Science Foundation Long-Term Ecological Research network, and develop Glacier National Park as a major site for intensive validation.
Derived from text
Algorithms; Data Bases; Ecosystems; Energy Conversion; Environment Models; Spacecraft Models

19980220392 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Postseismic Rebound in Fault Step-Overs Caused by Pore Fluid Flow
Peltzer, Gilles, Jet Propulsion Lab., California Inst. of Tech., USA; Rosen, Paul, Jet Propulsion Lab., California Inst. of Tech., USA; Rogez, Francois, Jet Propulsion Lab., California Inst. of Tech., USA; Hudnut, Ken, Geological Survey, USA; Science; Aug. 30, 1996; Volume 273, pp. 1202-1204; In English; Original contains color illustrations; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Near-field strain induced by large crustal earthquakes results in changes in pore fluid pressure that dissipate with time and produce surface deformation. Synthetic Aperture Radar (SAR) interferometry revealed several centimeters of postseismic uplift in pull-apart structures and subsidence in a compressive jog along the Landers, California, 1992 earthquake surface rupture, with a relaxation time of 270 +/- 45 days. Such a postseismic rebound may be explained by the transition of the Poisson's ratio of the deformed volumes of rock from undrained to drained conditions as pore fluid flow allows pore pressure to return to hydrostatic equilibrium.
Author
Seismology; Near Fields; Interferometry; Fluid Flow; Crusts

19980220477 Maine Univ., Darling Marine Center, Walpole, ME USA
Stability of Trifluoromethane in Forest SOIls and Methanotrophic Cultures
King, Gary M., Maine Univ., USA; FEMS Microbiology Ecology; 1997; ISSN 0168-6496; Volume 22, pp. 103-109; In English
Contract(s)/Grant(s): NAGw-3746; USDA-94-3710-7-0488; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Trifluoromethane (TFM) has been reported as an endproduct of trifluoroacetate degradation under oxic conditions. Although other halomethanes, such as chloroform, methyl bromide, and methyl fluoride, inhibit methane oxidation or are degraded by methanotrophs, the fate of TFM is unknown. TFM had no affect on atmospheric methane consumption when added to forest soils at either 10 ppm or 10,000 ppm. No degradation of TFM was observed at either concentration for incubations of 6 days. Cultures of Methylobacter albus BG8 and Methylosinus trichosporium OB3b grown With and without added copper were also used to assay TFM degradation at 10 10000 ppm levels. TFM did not inhibit methane oxidation under any growth conditions, including those

inducing expression of soluble methane monooxygenase, nor was it degraded at measurable rates. In contrast, parallel assays showed that both methyl fluoride and chloroform inhibited methane oxidation in M. trichosporium OB3b. Our results suggest that TFM may be relatively inert with respect to methanotrophic degradition. Although TFM has a negligible ozone depletion potential, it absorbs infrared radiation and has a relatively long atmospheric residence time. Thus, accumulation of TFM in the atmosphere as a consequence of the decomposition of hydrochlorofluorocarbons may have significant unpredicted climate impacts. Author

Methane; Methyl Compounds; SOIls; Air Pollution; Decomposition; Degradation

45
ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19980220162 Geological Survey, Water Resources Div., Reston, VA USA

Effects of Spatial Constraints on Channel Network Topology: Implications for Geomorphological Inference

deMoura daCosta Cabral, Mariz Coastanheira, Geological Survey, USA; Mar. 1998; 242p; In English

Report No.(s): PB98-155039; USGS/WRS/TR-157; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Table of Contents: Introduction; Sensitivity of Channel Network Planform Laws to Network Growth Processes in the Absence of Spatial Constraints; Space Filling Networks; Sensitivity of Channel Network Planform Laws to Network Growth Processes Under Spatial Constraints; Conclusions; Appendix A: Notation; Appendix B: Derivation of equation; Appendix C: Plots of topologic variables; and Appendix D: Digital Elevation Model Networks (DEMON): A model of flow over hillslopes for computation of contributing and dispersal areas.

NTIS

Channel Flow; Topology; Geomorphology; Networks; Inference

19980220230 Massachusetts Inst. of Tech., Ralph M. Parsons Lab., Cambridge, MA USA

Sensitivity of Regional Climate to Deforestation in the Amazon Basin

Eltahir, Elfatih A. B., Massachusetts Inst. of Tech., USA; Bras, Rafael L., Massachusetts Inst. of Tech., USA; Advances in Water Resources; 1994; ISSN 0309-1708; Volume 17, pp. 101-115; In English

Contract(s)/Grant(s): NAG5-1615; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The deforestation results in several adverse effect on the natural environment. The focus of this paper is on the effects of deforestation on land-surface processes and regional climate of the Amazon basin. In general, the effect of deforestation on climate are likely to depend on the scale of the defrosted area. In this study, we are interested in the effects due to deforestation of areas with a scale of about 250 km. Hence, a meso-scale climate model is used in performing numerical experiments on the sensitivity of regional climate to deforestation of areas with that size. It is found that deforestation results in less net surface radiation, less evaporation, less rainfall, and warmer surface temperature. The magnitude of the of the change in temperature is of the order 0.5 C, the magnitudes of the changes in the other variables are of the order of IO%. In order to verify some of he results of the numerical experiments, the model simulations of net surface radiation are compared to recent observations of net radiation over cleared and undisturbed forest in the Amazon. The results of the model and the observations agree in the following conclusion: the difference in net surface radiation between cleared and undisturbed forest is, almost, equally partioned between net solar radiation and net long-wave radiation. This finding contributes to our understanding of the basic physics in the deforestation problem. Author

Climate; Amazon Region (South America); Deforestation; Structural Basins; Mathematical Models; Environment Effects; Climate Models

19980220553 Federal Remediation Technologies Roundtable, Washington, DC USA

Site Remediation Technology InfoBase: A Guide to Federal Programs, Information Resources, and Publications on Contaminated Site Cleanup Technologies. First Edition

Aug. 1998; 80p; In English

Report No.(s): PB98-161185; EPA/542/B; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Table of Contents: Federal Cleanup Programs; Federal Site Remediation Technology Development Assistance Programs; Federal Site Remediation Technology Development Electronic Data Bases; Federal Electronic Resources for Site Remediation Technology Information; Other Electronic Resources for Site Remediation Technology Information; Other Electronic Resources

for Site Remediation Technology Information; Selected Bibliography: Federal Publication on Alternative and Innovative Site Remediation; and Appendix: Technology Program Contacts.
NTIS
Information Systems; Cleaning; Bibliographies; Information Resources Management

19980221022 ENSR Corp., Acton, MA USA
Results of the Independent Evaluation of ISCST3 and ISC-PRIME ***Final Report***
Paine, R. J., ENSR Corp., USA; Lew, F., ENSR Corp., USA; Nov. 1997; 844p; In English
Report No.(s): PB98-156524; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Aerodynamic building downwash is an important part of air quality dispersion modeling. The Electric Power Research Institute (EPRI) initiated a development program to address deficiencies in the downwash algorithms in the Industrial Source Complex (ISCST3) air dispersion model. The result of the project is a set of algorithms called PRIME (Plume Rise Model Enhancements) which were added to ISCST3. The new model was called ISC-PRIME. As part of the project, EPRI contracted with ENSR to prepare an independent evaluation of ISC-PRIME using a model evaluation protocol negotiated with the US EPA. This report describes the databases used in the evaluation and the results of the model performance evaluation.
NTIS
Downwash; Algorithms; Environment Models; Data Bases; Evaluation

19980221023 ENSR Corp., Acton, MA USA
Consequence Analysis for ISC-Prime ***Final Report***
Paine, Robert J., ENSR Corp., USA; Lew, Frances, ENSR Corp., USA; Nov. 1997; 318p; In English
Report No.(s): PB98-156516; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche

Aerodynamic building downwash is a phenomenon caused by eddies created by air movement around building obstacles. Through the use of the Industrial Source Complex (ISCST3) model, EPA modeling guidelines have incorporated these effects in ground-level concentration calculations. In 1992, the Electric Power Research Institute (EPRI) decided to embark upon a program (project PRIME: Plume Rise Model Enhancements) to design a new downwash model to correct the deficiencies in the ISCST3 model. The resulting downwash module, PRIME, has been installed in the ISCST3 model as a replacement for the current algorithm; the resulting model is referred to as 'ISC-PRIME'. This report describes the design of the model test runs involved and provides a summary of the results with comments on the differences between the two models.
NTIS
Plumes; Downwash; Air Pollution

19980221224 Eastern Research Group, Inc., Morrisville, NC USA
Locating and Estimating Air Emissions from Sources of Polycyclic Organic Matter ***Final Report***
Jul. 1998; 686p; In English
Contract(s)/Grant(s): 68-D7-0068
Report No.(s): PB98-159882; EPA/454/R-98-014; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This document presents information on (1) the types of sources that may emit polycyclic organic matter, (2) process variations and release points that may be emitted within these sources, and (3) available emissions information indicating the potential for polycyclic organic matter releases into the air from each operation. Its intended audience includes Federal, State and local air pollution personnel and others interested in locating potential emitters of polycyclic organic matter and in making estimates of air emissions therefrom.
NTIS
Air Pollution; Organic Materials; Polycyclic Aromatic Hydrocarbons; Emission; Estimating; Emittance

19980221225 Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
National Air Pollutant Emission Trends Procedures Document, 1900-1996; Projections 1999-2010
Nizich, Sharon V., Environmental Protection Agency, USA; Jun. 01, 1998; 720p; In English
Contract(s)/Grant(s): 68-D7-0067
Report No.(s): PB98-159908; EPA/454/R-98/008; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

Data from this report has also been used for the Biennial Assessment report, the Air Quality Trends report, the Industrial SO2 Report to Congress, and the 1994 Report to Congress. The emission estimates developed and included in the Emission Trends data base have been utilized to support development of the National Particulates Inventory, in support of recent evaluations of

the particulate matter and ozone NAAQS, in support of the FACA process, and in support of the CAA Section 812 retrospective analysis. The procedures document provides information on the methods and data used in the before mentioned report. Methods for calculating 1900-1996 and project estimates for 1999-2010 are also included.
NTIS
Air Pollution; Air Quality; Trends; Trend Analysis; Exhaust Emission

19980221243 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA
Highway and Vehicle Pollutant Levels along Texas Border Towns, *Sep. 1996 - Aug. 1997*
Perkinson, D. G., Texas A&M Univ., USA; Nov. 1997; 102p; In English
Report No.(s): PB98-164650; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The passage of the 1990 Clean Air Act Amendments (CAAA) has resulted in several Texas urban areas being declared nonattainment areas. Several other areas need to take actions to maintain current air quality levels to avoid being declared nonattainment. Many of these areas are considering transportation-related strategies to reduce emissions. This project quantifies on-road mobile source emissions within the four most populous border counties (Cameron, El Paso, Hidalgo, and Webb) and evaluated the contribution of Mexican vehicles to the overall emission levels. Information is also provided on the impacts of delay and idling at the international bridges. This information will assist in developing strategies to reduce or limit the growth of on-road mobile source missions through transportation projects and programs.
NTIS
Exhaust Emission; Air Quality; Exhaust Gases; Contaminants

19980221244 Midwest Research Inst., Cary, NC USA
Fabric Filter Bag Leak Detection Guidance
Bivins, D., Midwest Research Inst., USA; Sep. 1997; 38p; In English
Report No.(s): PB98-164676; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document provides guidance on the use of tribo-electric monitors as fabric filter bag leak detectors. This document includes fabric filter and monitoring system descriptions; guidance on monitor selection, installation, set up, adjustment, and operation; and quality assurance procedures. The monitor set up procedure in this guidance was developed based on testing conducted on shaker and pulse-jet baghouses; however, the guidance is expected to apply to reverse-air baghouses as well.
NTIS
Leakage; Air Pollution; Monitors; Detection

19980221246 GEOMET Technologies, Inc., Germantown, MD USA
California Population Indoor Exposure Model (CPIEM): Users Guide, 1.4F *Final Report*
Koontz, M. D., GEOMET Technologies, Inc., USA; Niang, L. L., GEOMET Technologies, Inc., USA; Jan. 1998; 182p; In English
Report No.(s): PB98-164858; GEOMET-IE-2632; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The model described in this document--the California population Indoor Exposure Model (CPIEM)--is a software product that has been designed to expedite the exposure-assessment process by providing a user interface and calculation tools for supplying and integrating all required information. This document is intended to assist the user in understanding (1) the general structure and purpose of the model, (2) the types of inputs required and how these inputs can be provided or accessed, (3) the types of calculations performed by the model and the extent to which these calculations can be controlled, and (4) how the results of the calculations can be saved and further analyzed. Hardware/software requirements and procedures for installing and accessing the software are outlined in Appendix A. Some example applications and results are also provided.
NTIS
Computer Programs; Exposure; Populations; User Manuals (Computer Programs)

19980221247 GEOMET Technologies, Inc., Germantown, MD USA
Development of a Model for Assessing Indoor Exposure to Air Pollutants: User's Guide, 1.4F *Final Report*
Koontz, M. D., GEOMET Technologies, Inc., USA; Evans, W. C., GEOMET Technologies, Inc., USA; Wilkes, C. R., GEOMET Technologies, Inc., USA; Jan. 1998; 188p; In English
Report No.(s): PB98-164866; GEOMET-IE-2631; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The objectives of the project described in this report were to develop and validate a software product (model) that can expedite the exposure-assessment process by providing a user interface and calculation tools for supplying and integrating all required

information. Two key requirements of the software are that it be (1) user friendly and (2) reasonably accurate without being overly complex.
NTIS
Air Pollution; Models; Exposure; Handbooks; Indoor Air Pollution

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19980219132 NASA Goddard Space Flight Center, Greenbelt, MD USA
Technical Report Series on Global Modeling and Data Assimilation, Volume 14, A Comparison of GEOS Assimilated Data with FIFE Observations
Bosilovich, Michael G., Universities Space Research Association, USA; Suarez, Max J., Editor, NASA Goddard Space Flight Center, USA; Schubert, Siegfried D., NASA Goddard Space Flight Center, USA; Aug. 1998; 94p; In English
Report No.(s): NASA/TM-1998-104606/VOL14; Rept-98B00068/VOL14; NAS 1.15:104606/VOL14; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

First ISLSCP Field Experiment (FIFE) observations have been used to validate the near-surface proper- ties of various versions of the Goddard Earth Observing System (GEOS) Data Assimilation System. The site- averaged FIFE data set extends from May 1987 through November 1989, allowing the investigation of several time scales, including the annual cycle, daily means and diurnal cycles. Furthermore, the development of the daytime convective planetary boundary layer is presented for several days. Monthly variations of the surface energy budget during the summer of 1988 demonstrate the affect of the prescribed surface soil wetness boundary conditions. GEOS data comes from the first frozen version of the assimilation system (GEOS-1 DAS) and two experimental versions of GEOS (v. 2.0 and 2.1) with substantially greater vertical resolution and other changes that influence the boundary layer. This report provides a baseline for future versions of the GEOS data assimilation system that will incorporate a state-of-the-art land surface parameterization. Several suggestions are proposed to improve the generality of future comparisons. These include the use of more diverse field experiment observations and an estimate of gridpoint heterogeneity from the new land surface parameterization.
Author
Models; Boundary Layers; Boundary Conditions; Diurnal Variations; Data Systems

19980219311 Geological Survey, Flagstaff, AZ USA
Pathfinder Landing Site: Alternatives to Catastrophic Floods and An Antarctic Ice-Flow Analog for Outflow Channels on Mars
Lucchitta, B. K., Geological Survey, USA; 1998; 2p; In English; 29th; Science, 1998, Houston, TX, USA; Sponsored by Lunar and Planetary Inst., USA
Contract(s)/Grant(s): NAGw-4545
Report No.(s): NASA/CR-1998-207567; NAS 1.26:207567; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Pathfinder spacecraft landed successfully at the mouth of the outflow channels Ares and Tiu Valles, returning a wealth of information about the surrounding landscape. One goal of the mission was to ascertain that catastrophic floods formed the outflow channels, the prevailing hypothesis for their origin. The follow-up reports on the mission proclaim that observations are ”consistent” with an origin by catastrophic flood; no alternative mechanisms for channel origin are considered. Thus, the impression is given that the problem of channel origin has been solved. Yet none of the observations are diagnostic of origin by catastrophic floods. Other origins are possible but have been ignored, for instance origin as liquefaction mudflows, debris flows, mass flows, or ice flows. Here I will examine landing site observations that have been used to infer origin by catastrophic flooding and suggest alternative origins. Finally, I will highlight some new observation from Antarctica that make an ice-flow mechanism plausible for the origin of some of the outflow channels.
Author
Mars Surface; Floods; Debris; Hypotheses; Mass Flow

19980219384 Stanford Univ., Thermosciences Div., Stanford, CA USA
Infrared Signature Masking by Air Plasma Radiation ***Annual Report, 1 Jun. 1997 - 31 Jul. 1998***
Kruger, C. H., Stanford Univ., USA; Laux, C. O., Stanford Univ., USA; 1998; 20p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG2-1079; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes progress during the second year of our research program on Infrared Signature Masking by Air Plasmas at Stanford University. This program is intended to investigate the masking of infrared signatures by the air plasma formed behind the bow shock of high velocity missiles. Our previous annual report described spectral measurements and modeling of the radiation emitted between 3.2 and 5.5 microns by an atmospheric pressure air plasma in chemical and thermal equilibrium at a temperature of approximately 3100 K. One of our goals was to examine the spectral emission of secondary species such as water vapor or carbon dioxide. The cold air stream injected in the plasma torch contained approximately 330 parts per million of CO2, which is the natural CO2 concentration in atmospheric air at room temperature, and a small amount of water vapor with an estimated mole fraction of 3.8 x 10(exp -4). As can be seen from Figure 1, it was found that the measured spectrum exhibited intense spectral features due to the fundamental rovibrational bands of NO at 4.9 - 5.5 microns and the V(3) band of CO2 (antisymmetric stretch) at 4.2-4.8 microns. These observations confirmed the well-known fact that infrared signatures between 4.15 - 5.5 microns can be masked by radiative emission in the interceptor's bow-shock. Figure I also suggested that the range 3.2 - 4.15 microns did not contain any significant emission features (lines or continuum) that could mask IR signatures. However, the signal-to-noise level, close to one in that range, precluded definite conclusions. Thus, in an effort to further investigate the spectral emission in the range of interest to signature masking problem, new measurements were made with a higher signal-to-noise ratio and an extended wavelength range.

Author

Infrared Signatures; Masking; Plasma Radiation; Air Flow; Research

19980219476 Alaska Univ., Physics Dept., Fairbanks, AK USA

A Survey of Large-Scale Variations in Thermospheric Oxygen Column Density with Magnetic Activity as Inferred from Observations of the FUV Dayglow

Nicholas, A. C., Alaska Univ., USA; Craven, J. D., Alaska Univ., USA; Frank, L. A., Iowa Univ., USA; Journal of Geophysical Research; Mar. 01, 1997; ISSN 0148-0227; Volume 102, No. A3; 17p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAGw-3441; NAGw-3436; NAG5-1915

Report No.(s): Paper-96JA03464; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Brightness of the terrestrial far-ultraviolet (FUV) dayglow is dominated by the 130.4-nm emission of neutral atomic oxygen, OI, and variations in the brightness observed from altitudes high above the emitting region reflect variations in thermospheric oxygen density. This paper summarizes the results of an initial survey of the Dynamics Explorer 1 observations of the FUV dayglow through a presentation of 13 representative events selected to demonstrate the spatial extent and short-term temporal stability of the brightness perturbations. The emphasis here is on the morning sector of local time and the polar cap for observations obtained in the time interval from September 23, 1981, through January 19, 1982. An analytic expression is derived for the average response of the FUV photometer to the dayglow during periods of high-latitude magnetic quiescence. The remaining observations in this time interval are then analyzed for their deviations from the established quiet time values. Deviations of -40% to +30% are found following intervals of increased magnetic activity. The most significant decreases (-30% to -40%) are observed equatorward of the instantaneous aurora] oval only after sustained periods (approx. 6 hours) of intense magnetic activity (average AE greater than approx. 700 nT). Decreases extend equatorward from the aurora to geographic latitudes as low as approx. 30 deg N. Decreases of lesser magnitude that do not extend as far equatorward are associated with sustained periods of more moderate activity in which the average value of AE is smaller (approx. 300-400 nT). Also, the spatial extent and magnitude of the decreases in the morning sector appear greater when the IMF B(sub y) component is positive. In both cases, decreases are readily observed within the polar cap. Localized enhancements of +20% to +30% occur much less frequently and are detected at the middle latitudes, well equator-ward of the auroral oval.

Author

Thermosphere; Oxygen Atoms; Gas Density; Surveys; Magnetic Variations; Dayglow

19980219477 Texas Univ. at Dallas, William B. Hanson Center for Space Sciences, Richardson, TX USA

Spatial Distribution of Ionospheric Plasma and Field Structures in the High-Latitude F Region

Kivanc, O., Texas Univ. at Dallas, USA; Heelis, R. A., Texas Univ. at Dallas, USA; Journal of Geophysical Research; Apr. 01, 1998; ISSN 0148-0227; Volume 103, No. A4, pp. 6955-6968; In English

Contract(s)/Grant(s): NAGw-4492

Report No.(s): Paper-97JA03237; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Ion density and velocity measurements from the Dynamics Explorer 2 (DE 2) spacecraft are used to obtain the average magnetic local time versus invariant latitude distribution of irregularities in the high-latitude F region ionosphere. to study the small-scale structure and its relationship to background conditions in the ionosphere, we have formed a reduced database using 2-s

(approx. = 16 km) segments of the ion density and velocity data. The background gradients associated with each 2-s segment and the spectral characteristics, such as power at 6 Hz (approx. = 1.3 km) and spectral index, are among the reduced parameters used in this study. The relationship between the observed plasma structure and its motion is complex and dependent on the externally applied fields as well as locally generated plasma structure. The evolution of plasma structures also depends critically on the conductivity of the underlying ionosphere. Observations indicate an enhancement of irregularity amplitudes in two spatially isolated regions in both the ion density and the velocity. Convective properties seem to play a more important role in winter hemisphere where smaller-scale structures are maintained outside the source regions. (Delta)V irregularity amplitudes are enhanced in the cusp and the polar cap during northward interplanetary magnetic field regardless of season. The power in (Delta)V is usually higher than that associated with local polarization electric fields, suggesting that the observed structure in (Delta)N/N is strongly influenced by (Delta)V structure applied to large density gradients.
Author
Spatial Distribution; Ionospherics; Plasmas (Physics); F Region; Latitude; Interplanetary Magnetic Fields

47
METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19980219352 Dynacs Engineering Co., Inc., Cocoa Beach, FL USA
Development of Algorithms and Error Analyses for the Short Baseline Lightning Detection and Ranging System
Starr, Stanley O., Dynacs Engineering Co., Inc., USA; Aug. 1998; 52p; In English
Contract(s)/Grant(s): NAS10-98001
Report No.(s): NASA/TM-1998-207913; NAS 1.15:207913; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

NASA, at the John F. Kennedy Space Center (KSC), developed and operates a unique high-precision lightning location system to provide lightning-related weather warnings. These warnings are used to stop lightning- sensitive operations such as space vehicle launches and ground operations where equipment and personnel are at risk. The data is provided to the Range Weather Operations (45th Weather Squadron, U.S. Air Force) where it is used with other meteorological data to issue weather advisories and warnings for Cape Canaveral Air Station and KSC operations. This system, called Lightning Detection and Ranging (LDAR), provides users with a graphical display in three dimensions of 66 megahertz radio frequency events generated by lightning processes. The locations of these events provide a sound basis for the prediction of lightning hazards. This document provides the basis for the design approach and data analysis for a system of radio frequency receivers to provide azimuth and elevation data for lightning pulses detected simultaneously by the LDAR system. The intent is for this direction-finding system to correct and augment the data provided by LDAR and, thereby, increase the rate of valid data and to correct or discard any invalid data. This document develops the necessary equations and algorithms, identifies sources of systematic errors and means to correct them, and analyzes the algorithms for random error. This data analysis approach is not found in the existing literature and was developed to facilitate the operation of this Short Baseline LDAR (SBLDAR). These algorithms may also be useful for other direction-finding systems using radio pulses or ultrasonic pulse data.
Author
Algorithms; Error Analysis; Lightning; Sensitivity; Random Errors; Meteorological Parameters; Ground Operational Support System; Data Processing

19980220391 Stanford Univ., STAR Lab., Stanford, CA USA
Blue Jets Produced by Quasi-Electrostatic Pre-Discharge Thundercloud Fields
Pasko, V. P., Stanford Univ., USA; Inan, U. S., Stanford Univ., USA; Bell, T. F., Stanford Univ., USA; Geophysical Research Letters; Feb. 01, 1996; ISSN 0094-8534; Volume 23, No. 3, pp. 301-304; In English
Contract(s)/Grant(s): NAGw-4738; NAGw-2871
Report No.(s): Paper 96GL00149; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Pre-discharge Quasi-Electrostatic (QE) fields immediately above the thundercloud lead to the formation and upward propagation of streamer type ionization channels with features in good agreement with recent video observations of Blue Jets.
Author
Ionization; Electric Fields

48
OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19980219178 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Sixth SeaWiFS/SIMBIOS Intercalibration Round-Robin Experiment (SIRREX-6), *Aug. - Dec. 1997*
Riley, Thomas, NASA Goddard Space Flight Center, USA; Bailey, Sean, Futuretech Corp., USA; Aug. 1998; 36p; In English
Report No.(s): NASA/TM-1998-206878; NAS 1.15:206878; Rept-98B00061; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For the sixth Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) Intercalibration Round-Robin Experiment (SIRREX-6), NASA personnel carried the same four Satlantic in-water radiometers to nine separate laboratories and calibrated them. Two of the sensors were seven-channel radiance heads and two were seven-channel irradiance heads. The calibration and data reduction procedures used at each site followed that laboratory's normal procedures. The reference lamps normally used for the calibration of these types of instruments by the various laboratories were also used for this experiment. NASA personnel processed the data to produce calibration parameters from the various laboratories
Author
Experiment Design; Remote Sensing; Sea Surface Temperature; Radiometers; Calibrating

19980219370 NASA Goddard Space Flight Center, Greenbelt, MD USA
SeaWiFS Technical Report Series, Volume 43, SeaWiFS Prelaunch Technical Report Series Final Cumulative Index
Firestone, Elaine R., Editor, General Sciences Corp., USA; Hooker, Stanford B., NASA Goddard Space Flight Center, USA; Apr. 1998; 75p; In English
Report No.(s): NASA/TM-1998-104566/VOL43; Rept-98B00047/VOL43; NAS 1.15:104566/VOL43; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is the follow-on ocean color instrument to the Coastal Zone Color Scanner (CZCS), which ceased operations in 1986, after an eight-year mission. SeaWiFS was launched on 1 August 1997, on the SeaStar satellite, built by Orbital Sciences Corporation (OSC). The SeaWiFS Project at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC), undertook the responsibility of documenting all aspects of this mission, which is critical to the ocean color and marine science communities. This documentation, entitled the SeaWiFS Technical Report Series, is in the form of NASA Technical Memorandum Number 104566 and 1998-104566. All reports published are volumes within the series. This particular volume, which is the last of the so-called Prelaunch Series serves as a reference, or guidebook, to the previous 42 volumes and consists of 6 sections including: an addenda, an errata, an index to key words and phrases, lists of acronyms and symbols used, and a list of all references cited. The editors have published a cumulative index of this type after every five volumes. Each index covers the reference topics published in all previous editions, that is, each new index includes all of the information contained in the preceding indexes with the exception of any addenda.
Author
Satellite Observation; Remote Sensing; Oceanography; Ocean Color Scanner; Ocean Data Acquisitions Systems

19980219479 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
[MODIS Investigation] *Semiannual Report*
Abbott, Mark R., Oregon State Univ., USA; Jan. 1997; 18p; In English
Contract(s)/Grant(s): NAS5-31360; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We are responsible for the delivery of two at-launch products for AM-1: Fluorescence line height (FLH) and chlorophyll fluorescence efficiency (CFE). In our last report we had planned to combine the two separate algorithms into a single piece of code. However, after discussions with Bob Evans, it was decided that it was best to leave the two algorithms separate. They have been integrated into the MOCEAN processing system, and given their low computational requirements, it easier to keep them separate. In addition, there remain questions concerning the specific chlorophyll product that will be used for the CFE calculation. Presently, the CFE algorithm relies on the chlorophyll product produced by Ken Carder. This product is based on a reflectance model, and is theoretically different than the chlorophyll product being provided by Dennis Clark (NOAA). These two products will be compared systematically in the coming months. If we decide to switch to the Clark product, then it will be simpler to modify the CFE algorithm if it remains separate from the FLH algorithm. Our focus for the next six months is to refine the quality flags that were delivered as part of the algorithm last summer. A description of these flags was provided to Evans for the MOCEAN

processing system. A summary was included in the revised ATBD. Some of the flags depend on flags produced by the input products so coordination will be required.
Derived from text
Algorithms; Chlorophylls; Fluorescence; Upwelling Water

19980219481 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
[MODIS Investigation] ***Semiannual Report***
Abbott, Mark R., Oregon State Univ., USA; Jan. 1998; 22p; In English
Contract(s)/Grant(s): NAS5-31360; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the last six months were: (1) Continue analysis of Hawaii Ocean Time-series (HOT) bio-optical mooring data, and Southern Ocean bio-optical drifter data; (2) Complete development of documentation of MOCEAN algorithms and software for use by MOCEAN team and GLI team; (3) Deploy instrumentation during JGOFS cruises in the Southern Ocean; (4) Participate in test cruise for Fast Repetition Rate (FRR) fluorometer; (5) Continue chemostat experiments on the relationship of fluorescence quantum yield to environmental factors; and (6) Continue to develop and expand browser-based information system for in situ bio-optical data. We are continuing to analyze bio-optical data collected at the Hawaii Ocean Time Series mooring as well as data from bio-optical drifters that were deployed in the Southern Ocean. A draft manuscript has now been prepared and is being revised. A second manuscript is also in preparation that explores the vector wind fields derived from NSCAT measurements. The HOT bio-optical mooring was recovered in December 1997. After retrieving the data, the sensor package was serviced and redeployed. We have begun preliminary analysis of these data, but we have only had the data for 3 weeks. However, all of the data were recovered, and there were no obvious anomalies. We will add second sensor package to the mooring when it is serviced next spring. In addition, Ricardo Letelier is funded as part of the SeaWiFS calibration/validation effort (through a subcontract from the University of Hawaii, Dr. John Porter), and he will be collecting bio-optical and fluorescence data as part of the HOT activity. This will provide additional in situ measurements for MODIS validation. As noted in the previous quarterly report, we have been analyzing data from three bio-optical drifters that were deployed in the Southern Ocean in September 1996. We presented results on chlorophyll and drifter speed. For the 1998 Ocean Sciences meeting, a paper will be presented on this data set, focusing on the diel variations in fluorescence quantum yield. Briefly, there are systematic patterns in the apparent quantum yield of fluorescence (defined as the slope of the line relating fluorescence/chlorophyll and incoming solar radiation). These systematic variations appear to be related to changes in the circulation of the Antarctic Polar Front which force nutrients into the upper ocean. A more complete analysis will be provided in the next Quarterly report.
Author
Data Acquisition; Ocean Data Acquisitions Systems; Algorithms; Computer Programs; Antarctic Ocean; Collection; Imaging Spectrometers; Ocean Color Scanner; Scientific Visualization; Sea Surface Temperature

19980219482 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
[MODIS Investigation] ***Semiannual Report***
Abbott, Mark R., Oregon State Univ., USA; Jul. 1997; 25p; In English
Contract(s)/Grant(s): NAS5-31360; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of the last six months were: (1) Revise the algorithms for the Fluorescence Line Height (FLH) and Chlorophyll Fluorescence Efficiency (CFE) products, especially the data quality flags; (2) Revise the MOCEAN validation plan; (3) Deploy and recover bio-optical instrumentation at the Hawaii Ocean Time-series (HOT) site as part of the Joint Global Ocean Flux Study (JGOFS); (4) Prepare for field work in the Antarctic Polar Frontal Zone as part of JGOFS; (5) Submit manuscript on bio-optical time scales as estimated from Lagrangian drifters; (6) Conduct chemostat experiments on fluorescence; (7) Interface with the Global Imager (GLI) science team; and (8) Continue development of advanced data system browser. We are responsible for the delivery of two at-launch products for AM-1: Fluorescence line height (FLH) and chlorophyll fluorescence efficiency (CFE). We also considered revising the input chlorophyll, which is used to determine the degree of binning. We have refined the quality flags for the Version 2 algorithms. We have acquired and installed a Silicon Graphics Origin 200. We are working with the University of Miami team to develop documentation that will describe how the MODIS ocean components are linked together.
Derived from text
Algorithms; Fluorescence; Data Systems; Oceans; Imaging Spectrometers; Chlorophylls

19980220268 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Assessment of Vulnerability to Sea Level Rise for Tianjin, China
Inoue, Kyoko, Ibaraki Univ., Japan; Mimura, Nobuo, Ibaraki Univ., Japan; Han, Mukang, Peking Univ., China; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 65-74; In Japanese; No Copyright; Avail:

Issuing Activity, Hardcopy, Microfiche

A research project has been conducted in a global scale by the initiative of the Intergovernmental Panel on Climate Change (FPCC) to study the vulnerability of coastal zones to global warming-induced sea level rise. This paper describes a case study for the city of Tianjin located on the Bohei Bsy Coast, China, carried out under the collaboration with Peking University as a part of the IPCC project. As future changes in sea level, two scenarios of 0.3 m and 1.0 m rises were assumed by the year 2100, and a 0.7 m rise due to storm surge was superposed on these scenarios. Extent and degree of impacts caused by the increased sea level were evaluated by using a geographical information system (GIS), in which distributions of population, industrial production, farm land, public facilities such as schools and hospitals, and other socio-economic parameters were inputted as well as contours of land elevation. Through this analysis, it was found that very severe impacts would occur in Tianjin; e.g., 44% of land would be under the mean sea level if the sea would rise by 1.0 m, and 56% of the population would be affected by the same situation. Author

Climate Change; Sea Level; Global Warming; Vulnerability; Seas; Coasts

19980220269 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

Geographical and Social Characteristics of a Small Island Country in the South Pacific Region and Impacts of Sea Level Rise on it: A Case Study for Tongatapu Island, the Kingdom of Tonga

Arai, Yuji, Ibaraki Univ., Japan; Mimura, Nobuo, Ibaraki Univ., Japan; Fifita, Netatua P., Ministry of Land, Survey and Natural Resources, Tonga; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 53-63; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A common methodology has been developed as a tool to assess the impacts of and the vulnerability to accelerated sea level rise. This methodology consists of practical seven steps, such as specification of sea level rise and climate change scenarios, inventory of coastal characteristics for a case study site, assessment of physical changes and their impacts, formulation of response strategies etc., in order to obtain the vulnerability profile in a national or regional scale. This paper describes an example of the vulnerability assessment focusing on a small island nation in the South Pacific, which is anticipated to receive considerable impacts. The case study site is the Tongatapu Island in the Kingdom of Tonga. The impacts would be considerably intensified by the combination of natural and social conditions, such as severe cyclones, land tenure system, and population growth. Author

Climate Change; Sea Level; Islands; Environmental Surveys

51
LIFE SCIENCES (GENERAL)

19980220228 Iowa Univ., Dept. of Psychology, Iowa City, IA USA

Fos Expression in Rat Brain During Depletion-Induced Thirst and Salt Appetite

Thunhorst, R. L., Iowa Univ., USA; Xu, Z., Iowa Univ., USA; Cicha, M. Z., Iowa Univ., USA; Zardetto–Smith, A. M., Iowa Univ., USA; Johnson, A. K., Iowa Univ., USA; American Journal of Physiology; 1998; ISSN 0363-6119; Volume 74, pp. R1807-1814; In English

Contract(s)/Grant(s): N00014-97-1-0145; NAG5-6171; NIH-MH-50260; NIH-HL-57492; NIH-HL-57472; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The expression of Fos protein (Fos immunoreactivity, Fos-ir) was mapped in the brain of rats subjected to an angiotensin-dependent model of thirst and salt appetite. The physiological state associated with water and sodium ingestion was produced by the concurrent subcutaneous administration of the diuretic furosemide (10 mg/kg) and a low dose of the angiotensin-converting enzyme (ACE) inhibitor captopril (5 mg/kg; Furo/Cap treatment). The animals were killed 2 h posttreatment, and the brains were processed for Fos-ir to assess neural activation. Furo/Cap treatment significantly increased Fos-ir density above baseline levels both in structures of the lamina terminalis and hypothalamus known to mediate the actions of ANG 2 and in hindbrain regions associated with blood volume and pressure regulation. Furo/Cap treatment also typically increased Fos-ir density in these structures above levels observed after administration of furosemide or captopril separately. Fos-ir was reduced to a greater extent in forebrain than in hindbrain areas by a dose of captopril (100 mg/kg sc) known to block the actions of ACE in the brain. The present work provides further evidence that areas of lamina terminalis subserve angiotensin-dependent thirst and salt appetite. Derived from text

Brain; Rats; Water; Sodium

19980220435 Maine Univ., Darling Marine Center, Walpole, ME USA

Ecophysiological Characteristics of Obligate Methanotrophic Bacteria and Methane Oxidation In Situ

King, Gary M., Maine Univ., USA; Microbial Growth on C(1) Compounds; 1993, pp. 303-313; In English

Contract(s)/Grant(s): NAGw-3746; NAGw-1428; NSF BSR 91-07315; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Most of the obligate methane-oxidizing bacteria (MOB) described to date are neutrophilic mesophiles that grow optimally in dilute media. Kinetic analyses generally indicate that bacterial methane uptake occurs by transport systems with a K(sub m) greater than l micronM. These and other properties of MOB are inconsistent with characteristics of methane oxidation in situ. The inconsistencies indicate a need for greater attention to the ecophysiological characteristics of isolates and the design of enrichment and isolation schemes which emphasize ecologically relevant parameters (e.g., low temperature, limited and diverse substrate availability, low water potential).

Author

Ecology; Physiological Effects; Bacteria; Oxidation; Methane

19980221242 Public Health Service, National Toxicology Program, Research Triangle Park, NC USA

Toxicology and Carcinogenesis Studies of Tetrahydrofuran (CAS No. 109-99-9) in F344/N Rats and B6C3F1 Mice (Inhalation Studies)

Jun. 1998; 252p; In English

Report No.(s): PB98-164544; NTP-TR-475; NIH/PUB-98-3965; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Tetrahydrofuran is used as a reaction medium for Grignard and metal hydride reactions; in the synthesis of butyrolactone, succinic acid, and 1,4-butanediol diacetate; in the fabrication of articles for packaging, transporting, and storing of foods; as a solvent for dyes and lacquers; and as a chemical intermediate in polymerization solvent for fat oils, unvulcanized rubber, resins, and plastics. Tetrahydrofuran is also an indirect food additive when it is in the contact surface of articles intended for use in food processing. Tetrahyydrofuran was nominated for study because of the potential for occupational exposure in humans. Male and female F344/N rats and B6C3F(sub 1) mice were exposed to tetrahydrofuran (approximately 99% pure) by inhalation for 14 weeks or 2 years. Genetic toxicology studies were conducted in Salmonella typhimurium, cultured Chinese hamster ovary cells, Drosophila melanogaster, mouse bone marrow cells, and mouse peripheral blood erythrocytes.

NTIS

Toxicology; Carcinogens; Cells (Biology); Mice; Rats; Tetrahydrofuran

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980219171 Civil Aeromedical Inst., Oklahoma City, OK USA

DNA Profiling as an Adjunct Quality Control/Quality Assurance in Forensic Toxicology *Final Report*

Chaturvedi, Arvind K., Civil Aeromedical Inst., USA; Vu, Nicole T., Civil Aeromedical Inst., USA; Ritter, Roxane M., Civil Aeromedical Inst., USA; Canfield, Dennis V., Civil Aeromedical Inst., USA; Jul. 1998; 10p; In English

Contract(s)/Grant(s): FAA-AM-B-97-TOX-202

Report No.(s): DOT/FAA/AM-98/18; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To investigate aircraft accidents, multiple postmortem biological samples of victims are submitted to the Civil Aeromedical Institute for toxicological evaluation. However, depending upon the nature of a particular accident, body components are often scattered, disintegrated, commingled, contaminated, and/or putrefied. These factors impose difficulties on victim identification, tissue matching, and thereby authentic sample analysis and result interpretation. Nevertheless, these Quality Control/Quality Assurance (QC/QA) related limitations can be overpowered by DNA profiling. In this regard, three situations are hereby exemplified where DNA analysis was instrumental in resolving a tissue mismatching/commingling issue, pinpointing an accessioning/analytical error, and interpreting an unusual analytical result. Biological samples from these cases were examined for six independently inherited genetic loci using Polymerase Chain Reaction (PCR) suitable for analyzing degraded DNA generally encountered in putrefied/contaminated samples. In the first situation, three of five specimen bags from one accident were labeled with two different names. DNA analysis revealed that one of these bags actually had commingled specimens, originating from two different individuals. Therefore, the sample was excluded from the final toxicological evaluation. In the second situation, an unacceptable blind control result was reported in a cyanide batch analysis. by comparing DNA profiles of the batch samples with those of the known positive and negative blind controls, it was concluded that the error had occurred during the analysis instead of accessioning. Accordingly, preventive measures were taken at the analytical level. The third situation was related to the pres-

ence of atropine at toxic concentrations in the blood (318 ng/mi) and lung (727 ng/g) with its absence in the liver, spleen, and brain-a pattern inconsistent with the general poisoning of drugs. DNA analysis of the blood and liver samples exhibited their common identity, ensuring that the submitted samples had indeed originated from one individual. The selective presence of atropine was attributed to its possible administration into the thoracic cavity by the emergency medical personnel at the accident site for resuscitation, but circulatory failure prevented its further distribution. These examples clearly demonstrate the applicability of the PCR-based DNA profiling in a QC/QA program to enhance the effectiveness of forensic toxicology operation. However, such applicability will be feasible only in those setups where in-house DNA facilities are accessible.
Author
Deoxyribonucleic Acid; Toxicology; Aircraft Accidents; Identities; Cyanides

19980219351 NASA Langley Research Center, Hampton, VA USA
Aerospace Medicine and Biology: A Continuing Bibliography, Supplement 474
Sep. 21, 1998; 27p; In English
Report No.(s): NASA/SP-1998-7011/SUPPL474; NAS 1.21:7011/SUPPL474; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This bibliography lists reports, articles and other documents recently introduced into the NASA scientific and technical information database. Subject coverage includes: Aerospace medicine and psychology, life support systems and controlled environments, safety equipment, exobiology and extraterrestrial life and flightcrew behavior and performance.
CASI
Bibliographies; Aerospace Medicine; Bioastronautics; Biological Effects; Exobiology; Indexes (Documentation)

19980220175 NASA Langley Research Center, Hampton,VA USA
Aerospace Medicine and Biology: A Continuing Bibliography, Supplement 475
Oct. 05, 1998; 27p; In English
Report No.(s): NASA/SP-1998-7011/SUPPL475; NAS 1.21:7011/SUPPL475; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliography with Indexes lists reports, articles, and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.
CASI
Aerospace Medicine; Bibliographies; Exobiology; Indexes (Documentation); Biological Effects

19980220226 Iowa Univ., Dept. of Psychology, Iowa City, IA USA
Salt Appetite: Interaction of Forebrain Angiotensinergic and Hindbrain Serotonergic Mechanisms
Menani, Jose Vanderlei, Paulista State Univ., Brazil; Colombari, Debora S. A., Iowa Univ., USA; Beltz, Terry G., Iowa Univ., USA; Thunhorst, Robert L., Iowa Univ., USA; Johnson, Alan Kim, Iowa Univ., USA; Brain Research; 1998; ISSN 0006-8993, pp. 1-7; In English
Contract(s)/Grant(s): N00014-97-1-0145; FAPESP-93/0167-7; NAG5-6171; NIH-HL-14388; NIH-HL-57472; NIH-HL-54292; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Methysergide injected into the lateral parabrachial nucleus (LPBN) increases the salt appetite of rats depleted of sodium by furosemide (FURO). The present study investigated the effects of angiotensin 2 (ANG 2) receptor blockade in the subfornical organ (SFO) on this increased salt appetite. The intake of 0.3 M NaCl and water was induced by combined administration of the diuretic, FURO, and the angiotensin-convertina, enzyme inhibitor, captopril (CAP). Pretreatment of the SFO with the anciotensin Type 1 (AT,) receptor antagonist, losartan (1 microgram/200 nl), reduced water intake but not 0.3 M NaCl intake induced by subcutaneous FURO+ CAP. Methysergide (4 microgram/200 nl) injected bilaterally into the LPBN increased 0.3 M NaCl intake after FURO + CAP. Losartan injected into the SFO prevented additional 0.3 M NaCl intake caused by methysergide injections into the LPBN. These results indicate that AT, receptors located in the SFO may have a role in mediatina the intake of sodium and water

induced by sodium depletion. They also suggest that after treatment with FURO + CAP an LPBN-associated scrotonergic mechanism inhibits increased sodium intake.
Author
Sodium; Pretreatment; Rats; Enzymes

19980220229 Iowa Univ., Dept. of Psychology, Iowa City, IA USA
The Neuroendocrinology of Thirst and Salt Appetite: Visceral Sensory Signals and Mechanisms of Central Integration
Johnson, Alan Kim, Iowa Univ., USA; Thunhorst, Robert L., Iowa Univ., USA; Frontiers in Neuroendocrinology; 1997; ISSN 0091-3022; Volume 18, pp. 292-353; In English
Contract(s)/Grant(s): N00014-97-1-0145; NAG5-6171; NAGw-4358; NIH-HL-14388; NIH-HL-57472; NIH-HL-54292
Report No.(s): Rept-FN970153; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This review examines recent advances in the study of the behavioral responses to deficits of body water and body sodium that in humans are accompanied by the sensations of thirst and salt appetite. Thirst and salt appetite are satisfied by ingesting water and salty substances. These behavioral responses to losses of body fluids, together with reflex endocrine and neural responses, are critical for reestablishing homeostasis. Like their endocrine and neural counterparts, these behaviors are under the control of both excitatory and inhibitory influences arising from changes in osmolality, endocrine factors such as angiotensin and aldosterone, and neural signals from low and high pressure baroreceptors. The excitatory and inhibitory influences reaching the brain require the integrative capacity of a neural network which includes the structures of the lamina terminalis, the amygdala, the perifornical area, and the paraventricular nucleus in the forebrain, and the lateral parabrachial nucleus (LPBN), the nucleus tractus solitarius (NTS), and the area postrema in the hindbrain. These regions are discussed in terms of their roles in receiving afferent sensory input and in processing information related to hydromineral balance. Osmoreceptors controlling thirst are located in systemic Viscera and in central structures that lack the blood-brain barrier. Angiotensin and aldosterone act on and through structures of the lamina terminalis and the amygdala to stimulate thirst and sodium appetite under conditions of hypovolemia. The NTS and LPBN receive neural signals from baroreceptors and are responsible for inhibiting the ingestion of fluids under conditions of increased volume and pressure and for stimulating thirst under conditions of bypovolemia and hypotension. The interplay of multiple facilitory influences within the brain may take the form of interactions between descending angiotensinergic systems originating in the forebrain and ascending adrenergic systems emanating from the hindbrain. Oxytocin and serotonin are additional candidate neuro- chemicals with postulated inhibitory central actions and with essential roles in the overall integration of sensory input within the neural network devoted to maintaining hydromineral balance.
Author
Adrenal Gland; Body Fluids; Sodium; Sympathetic Nervous System; Vasoconstrictor Drugs; Blood-Brain Barrier; Brain

19980221025 Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC USA
Health Effects Test Guidelines. OPPTS Series 870.1000 Acute Toxicity Testing: Background
Aug. 1998; 598p; In English
Report No.(s): PB98-101967; EPA/712/C-98/189; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

The Agency considers the evaluation of toxicity following short term exposure to a chemical to be an integral step in the assessment of its toxic potential under the regulatory framework of its pesticide and toxic substances programs. In the assessment and evaluation of the toxic characteristics of a substance, acute toxicity is generally performed by the probable route of exposure in order to provide information on health hazards likely to arise from short-term exposure by that route. For pesticides, the short-term toxicity testing battery consists of acute toxicity tests by the oral, dermal, and inhalation routes; skin and eye irritation testing; and testing for dermal sensitization. Data from an acute study may serve as a basis for hazard categorization, labeling, or child-resistant packaging and may also serve to designate pesticides which may be applied only by certified applicators. It is also an initial step in establishing a dosage regimen in subchronic and other studies and may provide information on absorption and the mode of toxic action of a substance.
NTIS
Health; Toxicity; Pesticides

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980220263 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Man-Machine Interface for NC Lathe Using a Personal Computer
Maekawa, Katsuhiro, Ibaraki Univ., Japan; Ohshima, Ikuya, Ibaraki Univ., Japan; Noguchi, Kazuhide, Niigata Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 117-129; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

With reference to the results of a questionnaire which was set out on man-machine interfaces to medium and small sized machining workshops, a prototype of interactive generation systems for NC parts program has been developed in order to make full use of a NC lathe in conjunction with a 16 bit personal computer on which the software runs. The programming system can be regarded as a user friendly man-machine interface since inexperienced workers easily generate tool paths which are visualized on the monitor screen. The authors focus the applications and propagation of the system on medium and small-sized factories as it includes the following features: (1) small size and low investment, and (2) easy and user friendly operation. A couple of examples of the operation sequences have been demonstrated, showing that this system can be extended to a fully automated NC parts programming system.
Author
Man Machine Systems; Personal Computers; Lathes; Numerical Control; Machining; Computer Aided Manufacturing

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.

19980221227 International Trade Commission, Director of Operations, Washington, DC USA
Static Random Access Memory Semiconductors from the Republic of Korea and Taiwan. Investigations Nos. 731-TA-761-762 ***Final Report***
Mazur, Diane, International Trade Commission, USA; Apr. 1998; 254p; In English
Report No.(s): PB98-160294; USITC/PUB-3098; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 735(b) of the Tariff Act of 1930 (19 U.S.C. section 1673d(b))(the Act), that an industry in the USA is not materially injured for threatened with material injury, and the establishment of an industry in the USA is not materially retarded, by reason of imports from the Republic of Korea of static random access memory semiconductors (SRAMs) that have been found by the Department of Commerce (Commerce) to be sold in the USA at less than fair value (LTFV). The Commission also determines, pursuant to section 735(b) the Act (19 U.S.C. section 1673d(b)), that an industry in the USA is materially injured by reason of imports from Taiwan of SRAMs that have been found by Commerce to be sold in the USA at LTFV.
NTIS
International Trade; Semiconductors (Materials); Random Access Memory; Semiconductor Devices

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19980220176 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Graph Embeddings, Symmetric Real Matrices, and Generalized Inverses ***Final Report***
Guattery, Stephen, Institute for Computer Applications in Science and Engineering, USA; Aug. 1998; 14p; In English
Contract(s)/Grant(s): NAS1-19480; NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-1998-208462; NAS 1.26:208462; ICASE-98-34; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Graph embedding techniques for bounding eigenvalues of associated matrices have a wide range of applications. The bounds produced by these techniques are not in general tight, however, and may be off by a log(exp 2) n factor for some graphs. Guattery and Miller showed that, by adding edge directions to the graph representation, they could construct an embedding called the current flow embedding, which embeds each edge of the guest graph as an electric current flow in the host graph. They also showed how this embedding can be used to construct matrices whose nonzero eigenvalues had a one-to-one correspondence to the reciprocals of the eigenvalues of the generalized Laplacians. For the Laplacians of graphs with zero Dirichlet boundary conditions, they showed that the current flow embedding could be used generate the inverse of the matrix. In this paper, we generalize the definition of graph embeddings to cover all symmetric matrices, and we show a way of computing a generalized current flow embedding. We prove that, for any symmetric matrix A, the generalized current flow embedding of the orthogonal projector for the column space of A into A can be used to construct the generalized inverse, or pseudoinverse, of A. We also show how these results can be extended to cover Hermitian matrices.
Author
Matrices (Mathematics); Laplace Equation; Eigenvalues; Eigenvectors

19980220272 Ibaraki Univ., Hitachi, Japan
Decentralized Autonomous Properties in Immune Network System and Genetic Algorithm
Tanaka, Kenji, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 21-28; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Decentralized autonomous systems are those systems that have the characteristics of living things composed of largely autonomous and decentralized units. This paper provides two system models to analyze the mechanism of the decentralized autonomous systems. The one is a Parallel Genetic Algorithm (PGA) model which is divided into a neighborhood model and an island model. The other is the Immune Network (IN) system model which was proposed by Jerne. We show that the two types of PGA models are suitable for simulating cooperative activities of units with the same goal, and that IN model is suitable for analyzing a transition process of equilibrium points under cooperation and competition. lastly, we refer to some conditions required for designing decentralized autonomous decision making system.
Author
Genetic Algorithms; Autonomy; Computerized Simulation; Biological Models (Mathematics); Immune Systems

19980220273 Ibaraki Univ., Hitachi, Japan
Design and Prototyping of Structured Editor for Programming Exercise
Ueda, Yoshikazu, Ibaraki Univ., Japan; Akiyama, Ken–ichi, Ibaraki Univ., Japan; Takezawa, Noriko, Mitsubishi Electric Corp., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 11-19; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In programming exercises, it is important to describe a program and data structurally, and to understand the structured program and data. For beginners, however, these structures, especially data structure, are very difficult to understand. In our study, to solve the above problem we develop an editor by which a beginner describes some understandable structures of program and data for programming education. ”Structured Editor” as our object treats the editorial target not as strings but as peculiar structure of language syntax or diagram, and realize the editorial operations for these structures. This paper reports the design and prototype of a new editor based on the characteristics of ”Structured Editor.”
Author
Data Structures; Structured Programming; Computer Programs

19980220389 Hawaii Univ., Dept. of Electrical Engineering, Honolulu, HI USA
Complementary Reliability-Based Decodings of Binary Linear Block Codes
Fossorier, Marc P. C., Hawaii Univ., USA; Lin, Shu, Hawaii Univ., USA; IEEE Transactions on Information Theory; Sep. 1997; ISSN 0018-9448; Volume 43, No. 5, pp. 1667-1672; In English
Contract(s)/Grant(s): NAG5-931; NAG5-2938; NSF NCR-94-15374; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This correspondence presents a hybrid reliability-based decoding algorithm which combines the reprocessing method based on the most reliable basis and a generalized Chase-type algebraic decoder based on the least reliable positions. It is shown that reprocessing with a simple additional algebraic decoding effort achieves significant coding gain. For long codes, the order of reprocessing required to achieve asymptotic optimum error performance is reduced by approximately 1/3. This significantly

reduces the computational complexity, especially for long codes. Also, a more efficient criterion for stopping the decoding process is derived based on the knowledge of the algebraic decoding solution.
Author
Algorithms; Binary Codes; Decoding; Errors; Optimization

19980220390 Hawaii Univ., Dept. of Electrical Engineering, Honolulu, HI USA
Some Decomposable Codes: The |a + x|b + x|a + b + x| Construction
Fossorier, Marc P. C., Hawaii Univ., USA; Lin, Shu, Hawaii Univ., USA; IEEE Transactions on Information Theory; 19970901; ISSN 0018-9448; Volume 43, No. 5, pp. 1663-1667; In English
Contract(s)/Grant(s): NAG5-931; NAG5-2938; NSF NCR-94-15374; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche
Codes with decomposable structure allow the use of multistage decoding procedures to achieve suboptimum bounded-distance error performance with reduced decoding complexity. This correspondence presents some new decomposable codes, including a class of distance-8 codes, that are constructed based on the|a + x|b + x|a + b + x| construction method. Some existing best codes are shown to be decomposable and hence can be decoded with multistage decoding.
Author
Decoding; Decomposition

19980221233 Rutherford Appleton Lab., Chilton, UK
IGIS: A Graphical User Interface for the IDA Program Package
Howells, W. S., Rutherford Appleton Lab., UK; Csoka, T., Rutherford Appleton Lab., UK; Adams, M., Rutherford Appleton Lab., UK; Kagunya, W., Rutherford Appleton Lab., UK; Dec. 1997; ISSN 1358-6254; 36p; In English
Report No.(s): PB98-145402; RAL-TR-97-074; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
IGIS (IDA Graphic User InterfaceS) is a GUI (Graphical User Interface) using a WIMP (Window Icon Mouse Pointer) environment to provide a user-friendly means of launching the Batch jobs in the IDA program suite. It carries out all the operations presently provided by the IDA Batch menu (using the command IDA). This manual is a guide to the menu system only-for descriptions of the programs themselves the user should refer to the IDA manual (CLRC Technical Report RAL-TR-96-006). The programs use the Tcl/Tk computer language with further extensions from Tix. For further information on these languages the user should refer to the appropriate manuals. Use of the window interface requires a fast computer and it is recommended that this package should only be run on an Alpha computer.
NTIS
Programming Languages; Graphical User Interface; Computer Programs; Data Processing; User Manuals (Computer Programs)

19980221234 National Inst. of Standards and Technology, Electronic Information Technologies Group, Gaithersburg, MD USA
Conformance Testing Object-Oriented Frameworks Using JAVA
Brady, Kevin G., National Inst. of Standards and Technology, USA; Saint Pierre, James, National Inst. of Standards and Technology, USA; Jul. 1998; 20p; In English
Report No.(s): PB98-148182; NISTIR-6202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper details the assumptions, decision processes, and conclusions reached during the development and implementation of a Conformance Testing Tool using the JAVA (refer:JAVA) programming language, and the Object Management Group's (OMG's) Common Object Request Broker Architecture (CORBA) specification (refer:CORBA) for distributed object communication. JAVA was used to implement the tests, and CORBA was used to provide the communication interact between the JAVA tests and the object under test. This test tool is being continually refined and expanded by the National Institute of Standards and Technology (NIST), but it was initially conceived as part of a collaborative effort between NIST and SEMATECH, 1994 to 1997, in support of the development of the SEMATECH Computer Integrated Manufacturing (CIM) Framework (refer:CIMF). SEMATECH had the foresight to include plans for conformance testing at the early stages of the CIM Framework specification development, and asked NIST to assist in this task. Although this initial implementation was developed for the semiconductor industry, the concepts, software and conclusions are relevant and applicable to conformance testing of any object-oriented framework.
NTIS
Object-Oriented Programming; Programming Languages; Performance Tests; Computer Programs

19980221248 Office of the Secretary of Defense, Washington, DC USA
Year 2000 Compliance: DOD Year 2000 Management Plan
Aug. 21, 1998; 80p; In English
Report No.(s): PB98-165079; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This plan provides the best guidance available to deal with the Y2K problem. It suggests a centralized planning, decentralized execution approach.
NTIS
Computer Programming; Systems Management; Checkout

19980221250 General Accounting Office, General Government Div., Washington, DC USA
Report to the Chairman, Subcommittee on Oversight, Committee on Ways and Means, House of Representatives. IRS' Year 2000 Efforts: Business Continuity Planning Needed for Potential Year 2000 System Failures
Jun. 15, 1998; 34p; In English
Report No.(s): PB98-167182; GAO/GGD-98-138; B-275431; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The authors' objectives were to (1) assess IRS' progress in converting its systems according to the guidelines in our Year 2000 assessment guide, (2) identify the risks IRS faces to completing the Year 2000 effort on time, and (3) identify risks to the continuity of IRS operations in the event of Year 2000-induced system failures.
NTIS
Computer Programming; Information Systems; Software Engineering

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COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19980220543 Office of Management and Budget, Office of Federal Procurement Policy, Washington, DC USA
From Paper to Electronics: An Assessment of Current Electronic Commerce Activity in Procurement
Mar. 1998; 32p; In English
Report No.(s): PB98-160492; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Office of Federal Procurement Policy Act requires the Administrator for Federal Procurement Policy to assess agency electronic commerce (EC) activity in procurement. This Assessment discusses the major EC initiatives that agencies are pursuing.
NTIS
Government Procurement; Procedures; Interfaces; Procurement Policy; Commerce

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CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

19980218951 Osaka City Univ., Dept. of Electrical Engineering, Japan
A comparative study of neural network approach and linear regression for analysis of multivariate data of the defect color on the color CRT displays
Purnomo, Mauridhi Hery, Osaka City Univ., Japan; Asano, Toshio, Hitachi Ltd., Japan; Shimizu, Eiji, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 15-22; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only
A comparative study of neural network approach and linear regression method for analyzing multivariate data of the defect color on the color CRT (Cathode Ray Tube) displays has been conducted. Multivariate data consist of the results of observations of different parameters for a number of defect color. An artificial neural network learning algorithm implementation to the problem is examined, with the different input parameter and dimensionality reduction; which means by relatively fewer parameters for a large body of data without loss of information. A multi-layer feed forward neural network utilizing the backpropagation algorithm has been employed to the recognition of defect color on the color CRT display. A simulation program develops the defect color on the color CRT display. Human eyes perform evaluation of the white uniformity grade by comparing with the standard grade. This is as a supervisor of the learning process of neural network. by using the same data, is also compared the performance

of analysis with conventional statistic linear regression method. We identify the grade level of defect color into six grades, both methods have similar performance, however, for the intelligent purpose in automatic production process, the neural network approach is more convenient.
Author
Cathode Ray Tubes; Neural Nets; Regression Analysis; Multivariate Statistical Analysis; Computer Graphics; Display Devices; Color

19980218963 Osaka City Univ., Dept. of Information and Computer Engineering, Japan
Learning efficiency and temperature coefficient of forward type three layer neural networks
Okamoto, Jiro, Osaka City Univ., Japan; Nakajima, Shigeyoshi, Osaka City Univ., Japan; Hosokawa, Shoichi, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 183-191; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

In this paper, the following topics are discussed: (1) in case of the forward type three layer neural network (NN), we make clear that there exists the most suitable number of units in the hidden layer. (2) In case of the multi-layer forward NN, when the total number of the units in the hidden layers is limited, the success rate of the learning is increased to arrange their units numbers as descending order from the input layer to the output one. (3) The learning of NN, whose temperature coefficient T is not one, is transformed into the equivalent learning scheme whose T is one, by changing the learning coefficient alpha to alpha/T(exp 2), so that we need not treat the temperature coefficient as an independent coefficient concerning the learning of NN.
Author
Neural Nets; Temperature Gradients; Machine Learning; Parity

19980219340 NASA Lewis Research Center, Cleveland, OH USA
Processing Speckle Patterns with Model Trained Neural Networks
Decker, Arthur J., NASA Lewis Research Center, USA; Fite, E. Brian, NASA Lewis Research Center, USA; Mehmed, Oral, NASA Lewis Research Center, USA; Thorp, Scott A., NASA Lewis Research Center, USA; 1997; 9p; In English; Optical Science, Engineering and Instrumentation, Optical Technology in Fluid, Thermal and Combustion Flow III, 28-31 Jul. 1997, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA
Contract(s)/Grant(s): RTOP 274-00-00; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Artificial neural networks can be used to process patterns corrupted by the laser speckle effect. This paper discusses an example where neural networks were used to detect structural damage using characteristic fringe patterns as input. The artificial neural networks were trained with fringe patterns generated from a finite element model and a simple model of the laser speckle effect. The neural networks were tested on patterns generated by both models and real structures. The neural networks are being developed as high-speed processors for electronic holography. This paper quantifies the overhead required to make neural networks robust to the laser speckle effect. There is a discussion of the ability of these networks to generalize at finite element resolutions on the underlying fringe patterns. The ultimate objective is to test whether combinations of electronic holography and neural networks can be effective interfaces between computational models and experiments or tests.
Author
Speckle Patterns; Mathematical Models; Holography; Damage; Structural Failure

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NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19980218962 Osaka City Univ., Dept. of Information and Communication Engineering, Japan
An accurate method for finding the control points of Bezier curves
Bhuiyan, Al–Amin, Osaka City Univ., Japan; Hama, Hiromitsu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 175-181; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Recently we proposed an algorithm for finding the control points of Bezier curves with minimum error. Although the method could find the control points efficiently, but nevertheless was suffered from several limitations: the error was more than 5%, learning time was high and the method was applicable only to symmetrically distributed points. This paper presents a fast and robust algorithm for finding the control points of the third order Bezier Curves. Our method is based on slope following and learning

algorithm that provides an efficient way of approximating control points from any set of points. Experimental results demonstrate that our method is efficient and robust for recovering the control points accurately.
Author
Algorithms; Curves (Geometry); Slopes; Computer Aided Design

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing: Monte Carlo method; and stochastic processes.

19980221021 National Inst. of Standards and Technology, Mathematical and Computational Science Div., Gaithersburg, MD USA
Truncating the Singular Value Decomposition for III-Posed Problems
Rust, Bert W., National Inst. of Standards and Technology, USA; Jul. 1998; 46p; In English
Report No.(s): PB98-157050; NISTIR-6131; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Discretizing the first-kind integral equations which model many physical measurement processes yields an ill-conditioned linear regression model b = Ax + eta, where x is a vector representation of the function being measured, A is an instrument response matrix, b is a vector of measurements, and eta is a vector of unknown, random measuring errors. Least squares estimation usually gives a sum of squared residuals much smaller than the expected value and wildly oscillating, physically implausible estimate x. These symptoms suggest that the least squares estimate captures part of the variance that properly belongs in the residuals. This paper suggests an alternate strategy which uses the variances of the measuring errors to specify a truncation for the elements of the rotated measurement vector U(exp T)b. The paper also develops some new diagnostics for the residuals which are useful not only for choosing the truncation level for the (U(exp T)b)(sub i), but also for assessing the quality of an estimate obtained by any procedure.
NTIS
Truncation Errors; Signs and Symptoms; Decomposition

70
PHYSICS (GENERAL)

For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19980220438 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Improvement of Characteristics of a Foucault Pendulum, Report 1
Itaba, Masanori, Ibaraki Univ., Japan; Ozawa, Satoru, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 247-252; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In Order to obtain the desired performance of a Foucault pendulum, an experimental investigation of the dynamic character of the pendulum has been carried out. The damping of the motion of the pendulum, origins of unfavorable modes of the motion and the mode coupling were studied. The obtained data were utilized for improving the pendulum performance.
Author
Gyroscopic Pendulums; Oscillations; Damping

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ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19980219316 Puerto Rico Univ., Mayaguez, Puerto Rico
Measurement of Nonlinear Receptivity to Surface Irregularities ***Interim Report, 1 May 1997 - 30 Apr. 1998***
Davila–Acaron, Jose B., Puerto Rico Univ., Puerto Rico; Hajj, Muhammad R., Virginia Polytechnic Inst. and State Univ., USA; 1998; 5p; In English

Contract(s)/Grant(s): NCC1-257; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Acoustic receptivity is the process by which acoustic disturbances are internalized into the shear layer to generate instability waves. Experiments have shown that, when tuned to the eigenvalue modes, the amplitude of the resulting T-S waves scales with the acoustic field intensity. When a surface irregularity is present, the characteristic wall wavenumber forces a spatial mode onto the near-wall mean velocity field, thus providing modal length scales comparable to those of T-S waves. In this experiment an attempt was made to increase the acoustic receptivity by exciting a difference mode via a quadratic interaction between two larger-wavenumber, forced modes. The difference mode is tuned to the dominant T-S eigenmode wavenumber. As expected, an increased receptivity corresponding to the difference mode was measured downstream of branch I, suggesting the presence of the nonlinearity.

Author

Acoustics; Surface Defects; Sound Fields; Nonlinearity; Experimentation

19980219341 NASA Lewis Research Center, Cleveland, OH USA

A "Buy Quiet" Program for NASA Lewis Research Center: Specifying Low Equipment Noise Emission Levels

Cooper, Beth A., NASA Lewis Research Center, USA; Nelson, David A., Hoover and Keith, Inc., USA; Noise-Con 1997; 1997, pp. 465-470; In English; Noise, 15-17 Jun. 1997, State College, PA, USA; Sponsored by Institute of Noise Control Engineering, USA

Contract(s)/Grant(s): RTOP 505-90-82; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Occupational and community noise exposures at the NASA Lewis Research Center are effectively managed via a three-part program that addresses hearing conservation, community noise control, and noise control engineering. More than 1100 civil servant and contractor employees are included in a hearing conservation program that encompasses OSHA 29CFR 1910.95 and the more stringent NASA Health Standard on Hearing Conservation. The Lewis Research Center Noise Exposure Management Program seeks to limit employee noise exposure and maintain community acceptance for critical research while actively pursuing engineered controls for noise generated by more than 100 separate research facilities and the associated services required for their operation. Historically, the primary emphasis of hearing conservation work at Lewis Research Center has been on identifying and providing adequate personal hearing protection equipment (e.g., earplugs, muffs) for civil servants and contract employees. Center policy and prudent engineering practice require, however, that these efforts be extended to engineering noise controls in order to reduce source noise levels in the future. To this end, NASA Lewis Research Center has recently implemented a "Buy Quiet' initiative with the goal of achieving long-term reduction of employee noise exposures through purchase of equipment that conforms to hearing conservation program goals. Project designers and engineers who purchase equipment expected to generate noise emission levels of concern for hearing conservation (80 dB(A) and above) are required to consider noise emissions along with other performance criteria. In order to provide them with the means to effectively pursue this approach, a Guide to specifying Equipment Noise Emission Levels has been published.

Author

Noise Reduction; Noise Intensity; Noise Generators; Policies; Education

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ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19980218999 University of Electro-Communications, Dept. of Applied Physics and Chemistry, Tokyo, Japan

Construction of Hetero-Atom NMR Databases, 3, Rhodium-103 NMR Data

Ichikawa, Tadashi, University of Electro-Communications, Japan; Yamasaki, Akira, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; Dec. 1996; ISSN 0915-0935; Volume 9, No. 2 (Serial No. 18), pp. 37-40; In Japanese; 15th; CODATA Conference, Sep. 1991, Tokuba, Japan; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Rhodium-103 NMR data collection is important for the wide application of many rhodium complexes and organorhodium compounds as the catalysts of various syntheses of fine organic chemicals. Almost 2000 data have been compiled from various original reports (about 40 references) and screened carefully. The chemical shift data conversion seems to be much difficult because of the arbitrary standard selection by each researcher group. The chemical shift database was constructed with lotus 1-2-3(TM) and DB-XL(TM) as well as the previous NMR databases covering scandium-45 through rhenium-183.

Author

Nuclear Magnetic Resonance; Rhodium Isotopes; Data Bases; Rhodium Compounds; Complex Compounds

19980219010 Old Dominion Univ., Dept. of Mathematics and Statistics, Norfolk, VA USA
A Multigroup Method for the Calculation of Neutron Fluence with a Source Term ***Final Report, Period ending 30 Sep. 1998***
Heinbockel, J. H., Old Dominion Univ., USA; Clowdsley, M. S., Old Dominion Univ., USA; Aug. 1998; 74p; In English
Contract(s)/Grant(s): NCC1-42; ODURF Proj. 171941; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Current research on the Grant involves the development of a multigroup method for the calculation of low energy evaporation neutron fluences associated with the Boltzmann equation. This research will enable one to predict radiation exposure under a variety of circumstances. Knowledge of radiation exposure in a free-space environment is a necessity for space travel, high altitude space planes and satellite design. This is because certain radiation environments can cause damage to biological and electronic systems involving both short term and long term effects. by having apriori knowledge of the environment one can use prediction techniques to estimate radiation damage to such systems. Appropriate shielding can be designed to protect both humans and electronic systems that are exposed to a known radiation environment. This is the goal of the current research efforts involving the multi-group method and the Green's function approach.
Derived from text
Damage; Evaporation; Neutrons; Prediction Analysis Techniques; Radiation Dosage

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OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19980218960 Osaka City Univ., Dept. of Information and Communication Engineering, Japan
Multicolor-Pattern light projection for 3D image matching
Yuan, Liyi, Osaka City Univ., Japan; Sein, Myint Myint, Osaka City Univ., Japan; Hama, Hiromitsu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 165-169; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

In this paper, a new kind of pattern called Multicolor-pattern for image matching is proposed. The Multicolor-pattern possesses the advantage over conventional pattern in high-precision of 3D image matching abuse its wide matching extent and has great potential in the application areas of image processing. In this paper, we will describe the principle of Multicolor-pattern light projection and describe how to design the Multicolor-pattern and its application of image processing.
Author
Image Processing; Color; Pattern Recognition

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SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19980220439 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan
Supermodulus Effect of Metallic Superlattice: A Computer Simulation Study
Taya, Shubo, Ibaraki Univ., Japan; Sasajima, Yasushi, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 239-246; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Coherent and incoherent multilayer models are constructed by the variable cell molecular dynamics under a constant pressure. The models are restricted in two dimensions for computational efficiency. Fully relaxed multilayer does not show supermodulus effect and does not alter its elastic constant even when repeat length changes. This has been confirmed by the similar calculation of 3 dimensional multilayer structure in which the atomic interaction is described by EAM (embedded atom method) potential. On the contrary, the elastic constant of the multilayer models of which only one of the constituent layers are strained under the influence of the substrate shows drastic change up to 50% of the bulks. This suggests that the residual stress in the multilayer causes the supermodulus effect. The several experiments reported much larger enhancement (several hundred %), therefore electronic effect associated with superlattice periodicity is considered to be essential for the full interpretation of supermodulus effect.
Author
Computerized Simulation; Superlattices; Two Dimensional Models; Elastic Properties; Laminates; Modulus of Elasticity

19980220440 Ibaraki Univ., Faculty of Engineering, Hitachi, Japan

Molecular Dynamics Simulation of Nucleation and Growth Process of Binary Quasicrystal

Tanaka, Hideki, Ibaraki Univ., Japan; Sasajima, Yasushi, Ibaraki Univ., Japan; Ichimura, Minoru, Ibaraki Univ., Japan; Itaba, Masanori, Ibaraki Univ., Japan; Ozawa, Satoru, Ibaraki Univ., Japan; Journal of the Faculty of Engineering, Ibaraki University; Dec. 1992; ISSN 0367-7389; Volume 40, pp. 231-237; In Japanese; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Quasicrystal structure is a new type of ordered phase because its Fourier transform has Laue spots with decagonal symmetry which is inconsistent with translational symmetry of crystal structure. Computer simulation of formation process of the quasicrystal was performed by molecular dynamics method. Based on Strandburg type of quasicrystal model, we developed an algorithm of formation process of binary quasicrystal reflecting realistic procedure as possible. Fourier transform of some of the obtained structures has shown decagonal symmetry although the spots are rather diffused. Potential parameter and experimental condition are discussed in order to produce perfect quasicrystal structure.

Author

Molecular Dynamics; Nucleation; Computerized Simulation; Crystal Structure; Algorithms; Crystal Growth

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THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19980219329 NASA Lewis Research Center, Cleveland, OH USA

Measurement of Xenon Viscosity as a Function of Low Temperature and Pressure

Grisnik, Stanley P., NASA Lewis Research Center, USA; Jul. 1998; 8p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 632-1B-1B

Report No.(s): NASA/TM-1998-208409; E-11244; NAS 1.15:208409; AIAA Paper 98-3498; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The measurement of xenon gas viscosity at low temperatures (175-298 K) and low pressures (350 torr-760 torr) has been performed in support of Hall Thruster testing at NASA Lewis Research Center. The measurements were taken using the capillary flow technique. Viscosity measurements were repeatable to within 3%. The results in this paper are in agreement with data from Hanley and Childs and suggest that the data from Clarke and Smith is approximately 2% low. There are no noticeable pressure effects on xenon absolute viscosity for the pressure range from 350 torr to 760 torr.

Author

Density Measurement; Gas Viscosity; Xenon

80
SOCIAL SCIENCES (GENERAL)

Includes educational matters.

19980220548 Helsinki Univ. of Technology, Helsinki Graduate School in Computer Science and Engineering, Espoo, Finland

Helsinki Graduate School in Computer Science and Engineering (HeCSE). Program 1998-1999

1998; 40p; In English

Report No.(s): PB98-161060; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Helsinki Graduate School in Computer Science and Engineering (HeCSE) is a post-graduate in computer science and computer engineering jointly offered by the Helsinki University of Technology (HUT) and the University of Helsinki (UH). HeCSE incorporates the following laboratories and departments: Laboratory of Information Processing Science (IPS); Laboratory of Telecommunications Software and Multimedia (TCM); Digital Systems Laboratory (DS); and Laboratory of Computer and Information Science (CIS).

NTIS

Schools; Information Systems; Universities; Computer Aided Design

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19980219314 University of Southern California, Los Angeles, CA USA
The Effect of Interruptions on Part 121 Air Carrier Operations ***Final Report***
Damos, Diane L., University of Southern California, USA; Jun. 30, 1998; 28p; In English
Contract(s)/Grant(s): NCC2-910; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary purpose of this study was to determine the relative priorities of various events and activities by examining the probability that a given activity was interrupted by a given event. The analysis will begin by providing frequency of interruption data by crew position (captain versus first officer) and event type. Any differences in the pattern of interruptions between the first officers and the captains will be explored and interpreted in terms of standard operating procedures. Subsequent data analyses will focus on comparing the frequency of interruptions for different types of activities and for the same activities under normal versus emergency conditions. Briefings and checklists will receive particular attention. The frequency with which specific activities are interrupted under multiple- versus single-task conditions also will be examined; because the majority of multiple-task data were obtained under laboratory conditions, LOFT-type tapes offer a unique opportunity to examine concurrent task performance under 'real-world' conditions. A second purpose of this study is to examine the effects of the interruptions on performance. More specifically, when possible, the time to resume specific activities will be compared to determine if pilots are slower to resume certain types of activities. Errors in resumption or failures to resume specific activities will be noted and any patterns in these errors will be identified. Again, particular attention will be given to the effects of interruptions on the completion of checklists and briefings. Other types of errors and missed events (i.e., the crew should have responded to the event but did not) will be examined. Any methodology using interruptions to examine task prioritization must be able to identify when an interruption has occurred and describe the ongoing activities that were interrupted. Both of these methodological problems are discussed In detail in the following section,

Author
Data Processing; Errors; Failure; Human Performance; Priorities

19980221231 Office of Management and Budget, Washington, DC USA
Office of Management and Budget Strategic Plan FY 1998 - FY 2003
Sep. 30, 1997; 20p; In English
Report No.(s): PB98-165103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mission of the Office of Management and Budget (OMB) is to help the President in carrying out his constitutional and statutory duties. OMB fulfills this mission primarily by assisting the President: (1) to create policy relating to expenditures and receipts, regulations, information and legislation; (2) To manage the Executive Branch of the government in the faithful execution of laws, policies and programs; and (3) by providing the highest quality of analysis and advice on a broad range of topics.

NTIS
Management Planning; Federal Budgets; Financial Management

19980221236 Bureau of Reclamation, Denver, CO USA
How to Get Things Done: Decision Process Guidebook. A Guide to Effective Solutions
1998; 284p; In English
Report No.(s): PB98-162720; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

The Guide is an in depth look at decision and government processes. The new, flexible approach to government decisions covers decision process and related concepts (e.g. agendas, politics, partnerships).

NTIS
Decision Making; Politics; Handbooks; Problem Solving; Management Planning

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

19980218955 Osaka City Univ., Dept. of Civil Engineering, Japan
A survey of books and monographs on plates
Kobayashi, Harutoshi, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering; Dec. 1997; Volume 38, pp. 73-98; In English; Also announced as 19980218948; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

Plates are used widely in all fields of engineering as one of the basic structural elements or machine parts, e. g., civil engineering structures, architectural structures, hydraulic structures, marine structures, aerospace structures, containers, instruments, etc. In view of importance of these wide applications, investigations on mechanical behavior of plates and developments of analytical and numerical methods for plate problems have been done extensively by a lot of researchers and construction engineers. In 1981, Naruoka published the monograph on plate research, in which over 12,000 research works on plate problems until April 1981 are listed. Since then overflowing research papers on plates have being appeared in many technical Journals. Present survey article lists about 500 publications of books and monographs on plates (slabs) including some those dealing with disk problems. The list is arranged in alphabetical order of the author's name. Many of the citations have been checked from the original publications and the book review articles presented in technical Journals, e.g., Applied Mechanics Reviews, Bauingenieur, Bautechnik, Beton- and Stahbetonbau, etc. But those from secondary sources are checked from the cross-reference. When the author began this survey work, the monograph by Naruoka was of great help. Many data of Russian publications are taken from Rabinovich's review book on Russian research works (1960), Szilard's text book on plates (1974), and Noor's survey article on shells (1990).
Author
Bibliographies; Plates (Structural Members); Slabs

19980219347 Bowie State Univ., Center for Research in Distributed Computing, MD USA
Research and Development for an Operational Information Ecology: The User-System Interface Agent Project *Final Report*
Srivastava, Sadanand, Bowie State Univ., USA; deLamadrid, James, Bowie State Univ., USA; Jul. 1998; 22p; In English
Contract(s)/Grant(s): NAG5-2277; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The User System Interface Agent (USIA) is a special type of software agent which acts as the "middle man" between a human user and an information processing environment. USIA consists of a group of cooperating agents which are responsible for assisting users in obtaining information processing services intuitively and efficiently. Some of the main features of USIA include: (1) multiple interaction modes and (2) user-specific and stereotype modeling and adaptation. This prototype system provides us with a development platform towards the realization of an operational information ecology. In the first phase of this project we focus on the design and implementation of prototype system of the User-System Interface Agent (USIA). The second face of USIA allows user interaction via a restricted query language as well as through a taxonomy of windows. In third phase the USIA system architecture was revised.
Derived from text
Research and Development; Computer Programs; Prototypes

19980221235 Helsinki Univ. of Technology, Lab. of Information Processing Science, Espoo, Finland
Experience in Introducing Product Data Management in a Manufacturing Company
Peltonen, H., Helsinki Univ. of Technology, Finland; Martio, A., Helsinki Univ. of Technology, Finland; Sulonen, R., Helsinki Univ. of Technology, Finland; Mar. 17, 1998; 26p; In English
Report No.(s): PB98-161037; TKK-TKO-B143; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper describes a product data management system (PDMS) developed as a joint project by a university research group and a lift manufacturing company. The system mainly supports the management of engineering documents with versions, subdocuments, multiple representations, etc. Important factors for the acceptance of the system include WWW tools for document browsing and good integration between the system and document manipulation tools. The project has demonstrated how the successful introduction of a PDMS in a company depends on a good understanding of the processes and requirements of the company.
NTIS
Data Management; Management Systems; Manufacturing; World Wide Web; Production Management

88
SPACE SCIENCES (GENERAL)

19980220173 NASA Goddard Space Flight Center, Greenbelt, MD USA
The PI-Mode of Project Management
Isaac, Dan, NASA Goddard Space Flight Center, USA; Apr. 1997; 45p; In English
Report No.(s): NASA/TM-1998-104645; Rept-97B00046; NAS 1.15:104645; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The PI-Mode is NASA's new approach to project management. It responds to the Agency's new policy to develop scientific missions that deliver the highest quality science for a fixed cost. It also attempts to provide more research opportunities by reducing project development times and increasing the number of launches per year. In order to accomplish this, the Principal Investigator is placed at the helm of the project with full responsibility over all aspects of the mission, including instrument and spacecraft development, as well as mission operations and data analysis. This paper intends to study the PI-Mode to determine the strengths and weaknesses of such a new project management technique. It also presents an analysis of its possible impact on the scientific community and its relations with industry, NASA, and other institutions.
Author
Project Management; Management Methods

89
ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19980219264 NASA Ames Research Center, Moffett Field, CA USA
Exozodiacal Dust Workshop
Backman, D. E., Editor, Franklin and Marshall Coll., USA; Caroff, L. J., Editor, NASA Ames Research Center, USA; Sandford, S. A., Editor, NASA Ames Research Center, USA; Wooden, D. H., Editor, NASA Ames Research Center, USA; Exozodiacal Dust Workshop; Conference Proceedings; Apr. 1998; 350p; In English; Exozodiacal Dust Workshop, 23-25 Oct. 1997, Moffett Field, CA, USA; Sponsored by NASA Ames Research Center, USA; Also announced as 19980219265 through 19980219298
Contract(s)/Grant(s): RTOP 344-37-22-05
Report No.(s): NASA/CP-1998-10155; A-98-10813; NAS 1.55:10155; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The purpose of the workshop was to understand what effect circumstellar dust clouds will have on NASA's proposed Terrestrial Planet Finder (TPF) mission's ability to search for terrestrial-sized planets orbiting stars in the solar neighborhood. The workshop participants reviewed the properties of TPF, summarized what is known about the local zodiacal cloud and about exozodiacal clouds, and determined what additional knowledge must be obtained to help design TPF for maximum effectiveness within its cost constraint. Recommendations were made for ways to obtain that additional knowledge, at minimum cost. The workshop brought together approximately 70 scientists, from four different countries. The active participants included astronomers involved in the study of the local zodiacal cloud, in the formation of stars and planetary systems, and in the technologies and techniques of ground- and space-based infrared interferometry. During the course of the meeting, 15 invited talks and 20 contributed poster papers were presented, and there were four working sessions. This is a collection of the invited talks, contributed poster papers, and summaries of the working sessions.
Derived from text
Terrestrial Planets; Astronomical Interferometry; Zodiacal Dust; Zodiacal Light; Planetary Systems

19980219265 Franklin and Marshall Coll., Lancaster, PA USA
Workshop introduction and summary of NASA panel report
Backman, D. E., Franklin and Marshall Coll., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 13-24; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This introductory paper consists of a short summary of the NASA Exo-Zodiacal panel report in the Appendix of these proceedings plus open questions presented for the workshop attendees to ponder. References to the points in this summary can be

found in the Appendix bibliography. Specific topics include the local zodiacal cloud, grain dynamics, dust sources, zodiacal cloud density versus time, signs of planets, other stars, and points deserving further discussion.
Derived from text
General Overviews; Zodiacal Dust; Terrestrial Planets

19980219266 Paris XI Univ., Institut d'Astrophysique Spatiale, Orsay, France
The structured zodiacal light
Reach, William T., Paris XI Univ., France; Exozodiacal Dust Workshop; Apr. 1998, pp. 25-44; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Thermal emission and scattered sunlight from interplanetary dust produce the zodiacal light, which dominates the infrared sky brightness for telescopes outside the Earth's atmosphere. Far brighter than typical astronomical sources, the zodiacal light poses problems for detection of light from outside the Solar System. Similarly, the thermal emission and scattered starlight from dust around other stars is a source of confusion in searching for extrasolar planets. In this review, I summarized what we know about the zodiacal light, emphasizing issues that might be relevant for designing missions to detect terrestrial planets around other stars.
Derived from text
Zodiacal Light; Terrestrial Planets; Sky Brightness; Interplanetary Dust; Extrasolar Planets

19980219267 General Sciences Corp., Laurel, MD USA
The near infrared and visual scattering properties of the zodiacal light
Berriman, G. Bruce, General Sciences Corp., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 45-58; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Sunlight scattered by interplanetary dust grains gives rise to the zodiacal light and is seen at wavelengths of lambda <3microns.Thebulkofthescatering is attributable to grains having radii in the range 10-100 microns, and these grains come in part from asteroidal material and in part from cometary material. At longer wavelengths, thermal radiation predominates over the scattered light. The thermal and scattered components contribute approximately equally in the 3.5 micron broad band filter. Near infrared surveys and observations have been made and are discussed in relation to the zodiacal light and interplanetary dust.
Derived from text
Zodiacal Light; Near Infrared Radiation; Light Scattering; Interplanetary Dust; Thermal Radiation

19980219268 Florida Univ., Astronomy Dept., Gainesville, FL USA
Signatures of planets
Dermott, S. F., Florida Univ., USA; Grogan, K., Florida Univ., USA; Holmes, E. K., Florida Univ., USA; Wyatt, M. C., Florida Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 59-84; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The disk of dust in our own solar system, aka the zodiacal cloud, carries clear signatures of the gravitational effects of the planets on the orbits of the dust particles. The signatures that have been identified in the IRAS and COBE data sets include: (1) A warp in the plane of symmetry of the cloud due to the fact that the planets do not have a common orbital plane; (2) A displacement of the Sun from the center of symmetry of the disk due to the fact that the orbits of the planets are eccentric; (3) Bands of dust associated with the breakup of large asteroids; and (4) Rings and clouds of dust produced by trapping of particles in resonances external to the orbit of the Earth. In addition, dust particles are expected to be trapped in resonances external to the orbits of the other planets. We also expect particles to be trapped in 1:1 resonances with the planets and to form Trojan-type clouds of dust that coorbit with the L4 and L5 Lagrangian equilibrium points.
Author
Zodiacal Dust; Gravitational Effects; Spectral Signatures; Planetary Orbits

19980219269 Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany
Measurements of solar system dust at R <1 AU and R 3 AU
Mann, Ingrid, Max-Planck-Inst. fuer Aeronomie, Germany; Hanner, Martha, Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 85-100; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In Situ experiments on space craft yield information about dust parameters such as velocity, flux and size, and mass of particles. In Situ experiments as well as brightness measurements in the inner solar system have been made with Helios from .3 to 1 AU in the ecliptic plane which reveal two different dust populations with different bulk densities and relative velocities to the

spacecraft. Zodiacal light measurements from Helios 1 and 2 reveal a radial brightness gradient proportional to R(exp -2.3). Measurements of dust particles in the outer solar system have been made onboard the Pioneer 10 and 11 spacecraft and for the high latitude region with Ulysses. Pioneer 10 and 11 also carried a spin-scan photopolarimeter that was used to map the zodiacal light and background starlight during the cruise to Jupiter in two broad bandpasses centered at .44 and .64 micron. Details of these measurements are briefly discussed.
CASI
In Situ Measurement; Zodiacal Light; Zodiacal Dust; Solar System

19980219272 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA
Infrared interferometry: A primer
Traub, Wesley A., Harvard-Smithsonian Center for Astrophysics, USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 129-148; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A search for planets around nearby stars can be done with infrared interferometry. The photometric evidence will be direct, as opposed to radial velocity evidence which is indirect. and because the direct technique collects photons from the planet itself, it can also tell us about the atmosphere via spectroscopy. Infrared (or longer) wavelengths provide a flux ratio advantage: in the solar system, the ratios of planetary to solar flux, for an external observer, are much greater in the infrared than in the visible. Interferometry provides the advantage of spatial discrimination, which gives us the potential to suppress star with respect to planet. These notes focus on selected aspects of infrared (IR) interferometry, as applied to the problem of searching for planets around nearby stars, in the presence of zodiacal dust both in the Solar System and around the target star. The 27 pages of view-graphs (VG) with figures and equations are an essential part of these notes. The original talk outline in VG 1 has been rearranged slightly for the present paper .
Author
Astronomical Interferometry; Infrared Interferometers; Infrared Telescopes

19980219273 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Sensitivity of the terrestrial planet finder
Beichman, Charles, Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 149-172; In English; Also announced as 19980219264
Contract(s)/Grant(s): NAS7-100; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A key long-term goal of NASA's Origins program is the detection and characterization of habitable planets orbiting stars within the solar neighborhood. A cold, space-borne interferometer operating in the mid-infrared with a approx. 75 m baseline can null the light of a parent star and detect the million-times fainter radiation from an Earth-like planet located in the "habitable zone" around stars as far as 15 pc away. Such an interferometer, designated the Terrestrial Planet Finder (TPF) by NASA, could even detect atmospheric signatures of species such as CO2, O3, and H2O indicative of either the possibility or presence of primitive life. This talk highlights some of the sensitivity issues affecting the detectability of terrestrial planets. Sensitivity calculations show that a system consisting of 2 m apertures operating at 5 AU or 4 m apertures operating at 1 AU can detect terrestrial planets in reasonable integration times for levels of exo-zodiacal emission up to 10 times that seen in our solar system (hereafter denoted as 10xSS). Additionally, simulations show that confusion noise from structures in the exo-zodiacal cloud should not impede planet detection until the exo-zodiacal emission reaches the 10xSS level.
Author
Terrestrial Planets; Infrared Interferometers; Spaceborne Telescopes; Extrasolar Planets; Signal Detection

19980219274 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Characterization of exozodiacal dust with the Keck interferometer, VLTI, and SIM
Colavita, Mark, Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 181-198; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This overview discusses three interferometers for characterization of exozodiacal dust: Keck Interferometer, the Very Large Telescope Interferometer (VLTI), and the Space Interferometry Mission (SIM). The emphasis will be toward the Keck Interferometer, as exozodiacal dust characterization is one of its science requirements.
Author
Characterization; Infrared Interferometers; Michelson Interferometers; Spaceborne Telescopes; Astronomical Interferometry; Zodiacal Dust

19980219275 National Radio Astronomy Observatory, Charlottesville, VA USA

Getting the dirt on exozodis with the MMA

Simon, R. S., National Radio Astronomy Observatory, USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 199-208; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The next generation of millimeter wavelength telescopes will have important capabilities relevant to the search for and characterization of zodiacal dust disks around nearby stars and extrasolar planets. Three instruments are at various stages of the planning and design phase: The Large Millimeter and Submillimeter Array (Japan), the Large Southern Array (Europe), and the Millimeter Array (USA). These instruments will be capable of detecting the thermal photospheric emission from thousands of stars, with the astrometric resolution and sensitivity required in searches for extrasolar planets. In addition, these instruments should be capable of the direct detection of dusty disks surrounding nearby stars, for disks as tenuous as 10 to 100 times the density of our own zodiacal dust cloud. In this talk I will outline the potential of millimeter wave radio telescopes for detecting and resolving exozodiacal dust disks (”exozodis”) which may exist around nearby stars. Adopting a simple model for the dust emission, I have estimated the thermal emission from exozodis at submillimeter wavelengths. Applying this calculation to stars in the recently released Hipparcos catalog yields a large number of nearby stars which are potential targets for a search for exozodis at millimeter wavelengths.

Author

Zodiacal Dust; High Resolution; Signal Detection; Radio Telescopes; Thermal Emission; Millimeter Waves

19980219276 Arizona Univ., Center for Astronomical Adaptive Optics, Tucson, AZ USA

Sensitivity of nulling interferometers to extra-solar zodiacal emission (EZE)

Angel, Roger, Arizona Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 209-218; In English; Also announced as 19980219264

Contract(s)/Grant(s): JPL-960427; F49620-96-1-0366; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

It should be possible to discover and to analyze the atmospheres of Earth-like planets of nearby stars, provided their thermal emission is not overwhelmed by a bright zodiacal cloud in the same system. Nulling interferometers in space, such as the Terrestrial Planet Finder, can efficiently suppress a stellar point source, but there is no way to suppress diffuse emission underlying the planet under study. A cloud much brighter than solar level would cause serious reduction in sensitivity, by its photon shot noise. Since some clouds have been detected that are orders of magnitude brighter, zodiacal measurements of TPF candidates to solar level are critically needed. These could be obtained relatively soon with the largest aperture ground-based interferometers observing in the 10 micron atmospheric window. A cloud would be detectable as an infrared excess, provided the stellar emission (some 10(exp 4) times brighter) is adequately suppressed by destructive interference. Ideally, the ground interferometer should have angular response similar to that of TPF, so as to measure directly the troublesome zodiacal component. The individual elements must be large, for even with approx. 8 m apertures, star cancellation and low thermal background, integration times of at least several hours will be needed to sense the clouds against shot noise from telescope thermal emission. In this paper we compare the sensitivity of TPF and ground based interferometers to a twin of the solar system at 10 pc, using Good’s (1994) model of the zodiacal cloud.

Author

Astronomical Interferometry; Infrared Interferometers; Thermal Emission; Zodiacal Dust; Zodiacal Light; Terrestrial Planets; Signal Detection; Infrared Radiation; Spaceborne Telescopes

19980219277 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

WIRE, SOFIA and SIRTF

Werner, Michael, Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 219-232; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

WIRE, SOFIA and SIRTF are three planned NASA missions for infrared astronomy. Each will make significant contributions to the study of exo-zodiacal dust, planetary debris disks, and/or the zodiacal material within our own solar system. These missions and their measurement and scientific capabilities are synopsized. The principal contribution of these missions to this field of study will be to establish and strengthen its intellectual foundations rather than to pinpoint specific targets for planetary searches. This is consistent with their relatively near-term availability. Moreover, this intellectual understanding can assure that subsequent missions approach this subject from a sound scientific perspective which will yield valuable results independent of the success of a particular planet finding strategy. Each of these missions - most urgently WIRE with its Fall, 1998 launch date - would make good

use of a list of candidate target stars for exo-zodiacal/planet-finding studies. The preparation of such a list was one of the recommendations of the exo-zodiacal workshop.
Author
Space Infrared Telescope Facility; Infrared Astronomy; Sofia (Airborne Observatory); Infrared Telescopes; Infrared Interferometers; Space Missions; Spaceborne Telescopes; Spectrographs

19980219278 Michigan Technological Univ., Physics Dept., Houghton, MI USA
The role of HST and NGST in characterizing exozodiacal light
Ftaclas, Christ, Michigan Technological Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 233-246; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The motivation for this conference is the realization that the zodiacal light of other stellar systems is not only a barrier to the detection of extrasolar planets but is also potentially a rich source of information about those planets, how they formed and how solar systems evolve. This presentation is directed to the science potential of visible light instruments that necessarily detect reflected light from circumstellar material. In particular we will examine the ability of the Hubble Space Telescope (HST) and the Next Generation Space Telescope (NGST) to examine extrasolar systems. Section II will discuss the appearance of our own zodiacal cloud in the visible as seen by an outside observer, Section III will discuss the basic problem in the visible for NGST and compare it to detection at 10 microns with an interferometer, Section IV will present results for NGST and Section V will discuss the HST.
Author
Zodiacal Light; Extrasolar Planets; Light Scattering

19980219279 Denver Univ., Astronomy Research Associate, Denver, CO USA
Infrared space observatory photometry of circumstellar dust in Vega-type systems
Fajardo–Acosta, S. B., Denver Univ., USA; Stencel, R. E., Denver Univ., USA; Backman, D. E., Franklin and Marshall Coll., USA; Thakur, N., Denver Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 265-266; In English; Also announced as 19980219264
Contract(s)/Grant(s): NAGw-3680; NAG5-3411; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The ISOPHOT (Infrared Space Observatory Photometry) instrument onboard the Infrared Space Observatory (ISO) was used to obtain 3.6-90 micron photometry of Vega-type systems. Photometric data were calibrated with the ISOPHOT fine calibration source 1 (FCS1). Linear regression was used to derive transformations to make comparisons to ground-based and IRAS photometry systems possible. These transformations were applied to the photometry of 14 main-sequence stars. Details of these results are reported on.
CASI
Main Sequence Stars; Stellar Envelopes; Astronomical Photometry

19980219280 European Space Agency. European Space Research and Technology Center, ESTEC, Astrophysics Div., Noordwijk, Netherlands
The ESA Infra-Red Interferometry Cornerstone Mission
Fridlund, C. V. M., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Exozodiacal Dust Workshop; Apr. 1998, pp. 267-268; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

A general overview including mission definition, scientific goals of infrared space interferometry, and technological status as they apply to ESA's IRSI (Infrared Space Interferometry Mission) is presented.
CASI
General Overviews; Space Missions; Astronomical Interferometry

19980219281 Florida Univ., Astronomy Dept., Gainesville, FL USA
Modeling the dust bands: Structure in zodiacal clouds
Grogan, K., Florida Univ., USA; Dermott, S. F., Florida Univ., USA; Wyatt, M. C., Florida Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 269; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The solar system dust bands discovered by IRAS are toroidal distributions of dust particles with common proper inclinations. The manner in which dust band profiles change around the sky should allow the determination of the origin of the bands, their radial extent and the size-frequency distribution of the material. The equilibrium model of the dust bands associating the dust

bands with the major Hirayama families, suggests EOS as the parent of the 10 degree pair. Comparisons of IRAS observations with two EOS dust band models are presented.
CASI
Zodiacal Dust; Mathematical Models; Solar System; Asteroid Belts

19980219282 NASA Johnson Space Center, Houston, TX USA
South-North and radial traverses through the interplanetary dust cloud
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Identical in situ dust detectors are flown on board the Galileo and Ulysses spacecraft. They record impacts of micrometeoroids in the ecliptic plane at heliocentric distances from 0.7 to 5.4 AU and in a plane almost perpendicular to the ecliptic from -79 deg to +79 deg ecliptic latitude. The combination of both Ulysses and Galileo measurements yield information about the radial and latitudinal distributions of micron and sub-micron sized dust in the solar system. Two types of dust particles were found to dominate the dust flux in interplanetary space: (1) Interplanetary micrometeoroids covering a wide mass range from 10(exp -16) to 10(exp -6) gr are mostly recorded inside 3 AU, and at latitudes below 30 deg; and (2) Interstellar grains with masses between 10(exp -14) and 10(exp -12) gr have been positively identified outside 3 AU near the ecliptic plane and outside 1.8 AU at high ecliptic latitudes (> 50 deg). Interstellar grains move on hyperbolic trajectories through the planetary system and constitute the dominant dust flux (1.5 x 10(exp -4)/ sq m sec) in the outer solar system and at high ecliptic latitudes. In order to compare and analyze the Galileo and Ulysses data sets, a new model is developed based on Divine's (1993) "Five populations of interplanetary meteoroids" model. by using this model, which takes into account the measured velocities and the effect of radiation pressure on small particles, we define four populations of meteoroids on elliptical orbits plus one population on hyperbolic orbits that all can fit the micrometeoroid flux observed by Galileo and Ulysses.
Derived from text
Meteoroid Concentration; Interplanetary Dust; Micrometeoroids; Radial Distribution

19980219283 Florida Univ., Astronomy Dept., Gainesville, FL USA
Modeling the effects of an offset of the center of symmetry in the zodiacal cloud
Holmes, E. K., Florida Univ., USA; Dermott, S. F., Florida Univ., USA; Xu, Y. L., Florida Univ., USA; Wyatt, M., Florida Univ., USA; Jayaraman, S., Vanguard Research, Inc., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 272-273; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

There is a possible connection between structure in circumstellar dust clouds and the presence of planets, our own zodiacal cloud being the prime example. Asymmetries in such clouds could be diagnostic of planets which would be otherwise undetectable. One such feature is an offset of the center of symmetry of the disk with respect to the central star. The offset is caused by the forced eccentricities (e(sub f)) of particles in the cloud. The orbit of a particle can be described by a set of five orbital elements: the semi-major axis (a), eccentricity (e), inclination (I), longitude of ascending node (Omega) and the argument of pericenter (omega). In low order secular perturbation theory, osculating elements of small bodies are decomposed into proper and forced elements. The proper elements are dependent on initial conditions while the forced elements are imposed on the particle's orbit by the gravitational perturbations of the planets. This decomposition is still applicable in the presence of drag forces. We compare COBE observations of the variation in average polar brightness of the background cloud, (N + S)/2, with ecliptic longitude of Earth with those of a model cloud made of asteroidal particles which populate the inner solar system according to a 1/r(exp gamma) where (gamma) = 1 (Poynting Robertson light drag) distribution. The variation with ecliptic longitude of Earth in mean polar brightness is shown in for the 25 micron waveband. Sine curves are fit to both the COBE observations and the model. The variation in (N+S)/2 with ecliptic longitude of Earth can be represented as a superposition of two sine curves: one for the variation in (N + S)/2 due to the Earth's eccentric orbit and the other for the variation in (N + S)/2 due to the forced eccentricities of particles in the cloud. If the cloud were symmetric about the Sun (i.e., if there were no offset), the maximum and minimum brightnesses of

the cloud would occur at perihelion and aphelion, respectively. Looking at the model, one can see that the minimum does occur at Earth's aphelion (282.9 deg). However, the minimum of the COBE curve is clearly displaced from aphelion, showing that the center of symmetry of the cloud is displaced from the Sun. If we could turn off the effect of the Earth's eccentricity, we could isolate the sine curve due to e(sub f). When we do this for the model cloud however, we do not see a variation in (N + S)/2 for two reasons: 1) Although the particle orbits are circularized due to Poynting Robertson drag (PR drag), the wedge shape of the cloud cancels out any number density variation as a function of radial distance; and 2) Even though we would expect the orbits of the particles to be more densely spaced at perihelion than at aphelion (provided all the particles had the same e(sub f) and omega(sub f), due to Kepler's Second Law the particles spend less time at perihelion than at aphelion thus canceling out any noticeable effect on the number density. However, when we build a new model cloud governed by a constant distribution of particles (1/r(exp gamma) where gamma = 0) instead of a 1/r distribution, we do see a sinusoidal variation in (N + S)/2 with ecliptic longitude of Earth. These results imply that the particles contributing to the observed offset do not have a PR drag distribution (i.e., they are not simply asteroidal particles). Future work will determine whether cometary particles (having a theoretical gamma = 1.5), collisionally evolved asteroidal particles, or a combination of both types of particles are responsible for the offset of the center of symmetry of the zodiacal cloud.
Author
Mathematical Models; Zodiacal Dust; Asymmetry; Eccentric Orbits

19980219284 Kobe Univ., Graduate School of Science and Technology, Japan
Photometry of zodiacal light and Gegenschein
Ishiguro, Masateru, Kobe Univ., Japan; Exozodiacal Dust Workshop; Apr. 1998, pp. 274; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

We summarize the results of our Gegenschein and zodiacal light observations at Haleakala (altitude 3055 m, Hawaii) between the dates of 19 August and 25 September in 1995, at Norikura (altitude 2876 m, Japan) on 18 September 1996, and at Kiso (altitude 1130 m, Japan) between the dates of 9 February and 5 March in 1997. The instrument we used consists of a fish-eye lens or a wide angle lens attached to a cooled CCD camera with blue, green, and red filters. We have found a significant excess of the brightness near the antisolar point. The position of the maximum brightness of this excess (the Gegenschein) slightly deviated from the antisolar point to the south in September and to the north in February. On the other hand, the locus of points of maximum brightness of the evening zodiacal light is significantly shifted toward the north from the ecliptic plane. While the result of morning zodiacal light measurements obtained at Haleakala (altitude 3055 m, Hawaii) in September revealed the locus shifted toward the south. Our observed evidence suggests that these variations were caused by the annual motion of the Earth with respect to the plane of the zodiacal cloud. When the symmetric plane of the zodiacal dust cloud differs from the ecliptic plane, it is natural that the contour morphology of the Gegenschein and zodiacal light will vary with the season. Our model calculations for the zodiacal light suggest that our observed results of the Gegenschein agree with the predictions deduced from a cloud model having a symmetric plane on the invariable plane of the solar system.
Author
Zodiacal Light; Photometry; Gegenschein; Space Observations (From Earth)

19980219285 Vanguard Research, Inc., Scotts Valley, CA USA
Planetary detection using circumstellar rings
Jayaraman, Sumita, Vanguard Research, Inc., USA; Lien, David, Vanguard Research, Inc., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 275; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Planets embedded in circumstellar disks trap dust particles, spiraling towards the central star due to Poynting-Robertson drag, into outer mean motion resonances. The resonant trapping leads to a local enhancement of the dust creating a circumstellar ring at the semimajor axis of the planet. The number density of particles in the ring depends upon the drag rate of the particles and the mass of the planet. Such a ring formed by asteroidal particles has been detected around the Earth. The structure of the ring depends upon the circumstellar radiation environment, the mass of the star and the planet, the number density of dust in the disk, and the size distribution of the particles. We have developed models of resonant rings at different orientations from edge-on, (incl = 0 deg) to face-on, (incl = 90 deg) using a dynamic model of the resonant ring at 1 AU associated with the Earth. A composite image of a model disk and a ring has also been created using a simple background dust distribution. The integrated brightness profiles in, and normal to, the plane of the disk deviate significantly from a smooth scan and show the signature of a planet. The following characteristics of Resonant Rings provide evidence for the presence of a planet embedded in a stellar disk: (1) Sharp features that occur in pairs in the brightness profiles of the disk is the typical signature for a ring and, consequently, for the presence of a planet; (2) The ring is rotationally asymmetric and locked to the motion of the planet. Hence, time variations in azimuthal brightness,

particularly in face-on, disks (incl >> 90 deg), is a measure of the period of the planet; and (3) For massive planets (m(sub p) > mass of Jupiter), the fraction of particles trapped can be high enough to halt the flow of particles to the star, thereby creating a gap in the disk.
Author
Stellar Envelopes; Dynamic Models; Trapped Particles; Planets; Detection

19980219286 European Space Agency. European Space Operations Center, Darmstadt, Germany
IR Interferometer Cornerstone Mission analysis
Jehn, R., European Space Agency. European Space Operations Center, Germany; Hechler, F., European Space Agency. European Space Operations Center, Germany; Fridlund, M., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Penny, A., Rutherford Appleton Lab., UK; Exozodiacal Dust Workshop; Apr. 1998, pp. 276-277; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

As part of the studies of the Infrared Space Interferometer (IRSI) Cornerstone Mission candidate, ESOC has constructed a model of the expected infrared brightnesses of the sky due to emission from the interplanetary dust, at radial distances from the Sun out to 10 AU in the Ecliptic and 2 AU out of the Ecliptic. This model was then used to calculate the effect of these fluxes on the performance of IRSI with different mission orbits.
Derived from text
Infrared Interferometers; Interplanetary Dust; Sky Brightness; Light Emission

19980219287 NASA Ames Research Center, Moffett Field, CA USA
Mission goals of a 1998/1999 Leonid storm Multi-instrument Aircraft Campaign (MAC)
Jenniskens, P., NASA Ames Research Center, USA; Butow, S., NASA Ames Research Center, USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 278; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

In November of 1998 (or in 1999 with about equal probability) will be our one chance in a lifetime to anticipate with some certainty the occurrence of a meteor storm. For a period of up to 2 hours, rates are expected to increase above 1 meteor per second for a naked eye observer. At that time, Earth passes through the outer regimes of the dust trail of comet 55P/Tempel-Tuttle. The high meteor flux offers unprecedented precision in characterizing the dust trail in terms of spatial and particle size distributions of dust grains and allows the measurement of composition, morphology and orbits of individual cometary grains relatively soon after ejection from the comet. by using the Earth's atmosphere as a detector for the dust trains, grains are sampled over a wide mass range, from the typical grain size of zodiacal dust (40 - 200 micron) up until the rare boulders that can still be lifted off the comet nucleus.
Derived from text
Comet Tails; Meteoroid Concentration; Meteoroid Showers; Leonid Meteoroids; Zodiacal Dust; Tempel 2 Comet

19980219288 California Inst. of Tech., Pasadena, CA USA
A search for exo-zodiacal dust disks using speckle interferometry at 11.7 microns
Kuchner, Marc, California Inst. of Tech., USA; Brown, Mike, California Inst. of Tech., USA; Koresko, Chris, California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 279-281; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Much of the future study of exo-zodiacal dust will rely on specially designed multi-element interferometers for high angular resolution and dynamic range. But it is already possible to resolve 1-3 AU regions around several of the closest stars with a single-element device: the 10 meter W. M. Keck telescope at Mauna Kea. We have begun a study of nearby stars with this telescope, and using the technique of speckle interferometry to recover the 240 milliarcsecond diffraction limit at 11.7 microns and distinguish extended dust emission from the wings of the stellar image.
Derived from text
Speckle Interferometry; Zodiacal Dust; Stellar Envelopes; Space Observations (From Earth); Infrared Interferometers; Infrared Telescopes

19980219289 Vanguard Research, Inc., Scotts Valley, CA USA
"CHON" particles: The interstellar component of cometary dust
Lien, David J., Vanguard Research, Inc., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 282; In English; Also announced as 19980219264
Contract(s)/Grant(s): NAGw-3377; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Interstellar dust is characterized by strong absorption in the ultraviolet and the mid-IR. Current models of interstellar dust are based on three chemically distinct components: a form of carbon (usually graphite), a silicate, and a blend of polycyclic aromatic hydrocarbons or other carbonaceous material. Previous work using effective medium theories to understand the optical properties of cometary dust suggested that an amalgam of materials could reproduce the observed interstellar and cometary dust features. Recently, Lawler and Brownlee (1992) re-analyzed the PIA and PUMA-1 data sets from the Giotto flyby of P/Halley and discovered that the so-called ”CHON” particles were actually composed of a blend of carbon-bearing and silicon-bearing materials. Based on effective medium theories, the absorption spectrum of such a material would display the spectral features of each of the components - strong UV absorption from the carbonaceous component and strong absorption in the IR from the silicate component. to test this idea, vapor-deposited samples were created using two different deposition techniques: sputtering with an argon RF magnetron and deposition from an argon plasma torch. Two different compositions were tested: a blend of graphite and silica in a 7:1 ratio and an amalgam of materials whose approximate composition matches the ”CHON”-silicate abundances for the uncompressed PIA data set of Lawler and Brownlee: graphite, iron oxide, magnesium oxide, ammonium sulfate, calcium carbonate, and silica in mass ratios of 6:4.3:4:2.2:1:9. The samples were finely ground and pressed into 2” diameter disks using a 40 ton press. In all, four different experiments were performed: one with each of the compositions (C:SiO and ”CHON”) in both the RF magnetron and the plasma torch chambers. The RF magnetron created a uniform dark thin film on the substrate surface, and the plasma torch created a coating of small (<100micron)diametergreyparicles. The spectra of all four samples show a strong, broad absorption feature at around 220 nm as well as a strong but narrower absorption peak near 10 microns. The RF magnetron sputtered samples showed some sub-structure in the UV, and the peak of the absorption was shifted toward longer wavelengths. The UV absorption in the plasma torch deposited samples have no sub-structure, and the peak absorption is very near 220 nm. Strong absorption near 9 microns is seen in the spectra from both sample preparation techniques, and is consistent with the IR spectra of some terrestrial silicates. Other features, particularly at 6.2 and 8.6 microns, are seen in the interstellar medium. A strong feature near 2 microns is due to absorbed water in the sample. Based on the results of these experiments, there is evidence that a material with a composition similar to that detected in ”CHON” particles in the coma of P/Halley have a spectral signature which reproduces the main absorption features of interstellar dust. This suggests that the ”CHON” particles could be the interstellar component of cometary dust.
Author
Absorption Spectra; Interplanetary Dust; Interstellar Chemistry; Silicates; Carbonaceous Materials; Comets

19980219290 Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, Germany
Radiation pressure forces on circumstellar dust particles
Mann, Ingrid, Max-Planck-Inst. fuer Aeronomie, Germany; Kimura, Hiroshi, Max-Planck-Inst. fuer Aeronomie, Germany; Voshchinnikov, Nikolai V., Saint Petersburg Univ., Russia; Il’in, Vladimir B., Saint Petersburg Univ., Russia; Exozodiacal Dust Workshop; Apr. 1998, pp. 283; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

We present model calculations of the radiation pressure forces acting on dust particles around stars based on the discrete dipole approximation method as well as the separation of variables method and the Maxwell-Garnett mixing rule. Carbon and silicates were chosen as material of the dust particles. The blackbody radiation of the stars with the effective temperatures in the range 2000-7000 K was considered. This interval covers late-type giants, solar type stars, and Herbig Ae/Be stars. The radiation pressure acting on submicrometer-sized particles around stars increases with the photospheric temperature of the star, indicating the growth of the scattering efficiency of particles with sizes larger than the wavelength of the scattered light. We show that porous, fluffy particles in the submicrometer size range can have longer lifetimes in circumstellar regions than compact (spherical) particles. Going to larger sizes of particles, the effect is reversed. The radiation pressure force for porous particles is only gradually reducing with decreasing size of the particles. As a consequence, the size range of particles that can stay in bound orbits around the star is much smaller for porous particles than for compact particles. We estimate the transverse component of the radiation pressure force on non-spherical particles. It can reach up to about 10% of the radial component in the surroundings of stars with photospheric temperatures beyond 6000 K. This effect is even stronger for compact dielectric grains and may influence their dynamics.
Author
Radiation Pressure; Cosmic Dust; Stellar Envelopes; Microparticles; Porosity

19980219291 NASA Ames Research Center, Moffett Field, CA USA
IRTS observation of zodiacal light and emission
Matsumoto, T., Tokyo Univ., Japan; Murakami, H., Tokyo Univ., Japan; Onaka, T., Tokyo Univ., Japan; Ootsubo, T., Tokyo Univ., Japan; Roellig, T. L., NASA Ames Research Center, USA; Chan, K. –W., NASA Ames Research Center, USA; Noda, M., Nagoya City Science Museum, Japan; Exozodiacal Dust Workshop; Apr. 1998, pp. 284-285; In English; Also announced as 19980219264;

No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

We present the infrared spectrum of the zodiacal light and emission obtained by the Near-Infrared Spectrometer (NIRS) and Mid-Infrared Spectrometer (MIRS) onboard the Infrared Telescope in Space (IRTS). The wavelength coverages and spectral resolutions are 1.4-4.0 microns and 0.12 microns for the NIRS, and 4.5-11.7 microns and 0.23-0.36 microns for the MIRS respectively. Both instruments have the same beam size of 8 arcminutes square. The IRTS observations were made for 1995 March 29 - April 26. Here we present the data of two days, April 19 and April 20.

Author

Zodiacal Light; Spectral Resolution; Light Emission; Infrared Spectra

19980219292 Kobe Univ., Information Processing Center, Japan

Optical properties of dust aggregates in the disk of Beta Pictoris

Nakamura, R., Kobe Univ., Japan; Exozodiacal Dust Workshop; Apr. 1998, pp. 286; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Beta Pictoris is the best studied Vega-type star with the optically resolved circumstellar dust disk. However, the typical size of dust particles in the disk is still an open question. Several optical observations have indicated that the color of the disk is same as the beta Pic itself within the observational uncertainties. This result has been interpreted that dust size, responsible for the scattered light, is larger than 1 micron. On the other hand, infrared observations suggest smaller typical size less than 1 micron. Telesco et al. (1988) observed thermal emission from the disk at 10 and 20 microns. As the deduced color temperature is much higher than blackbody, they concluded that the dust particle, which emit most of thermal infrared radiation, must be smaller than 1 micron. Mid infrared spectroscopy also infers that submicron-sized particles dominate thermal radiation from the disk because the observed silicate feature would diminish if the typical dust size exceeds several microns. Based on the similarity to the Interplanetary Dust Particles (IDPs), we present a new model of the dust particles around Beta Pictoris and calculate the optical properties by Discrete Dipole Approximation with a1-term method. The scattering cross sections in optical region becomes neutral when the mass-equivalent sphere exceeds 0.6 micron independent of the monomer size. The infrared silicate feature is present even for large aggregates whose mass-equivalent radius is 6 micron. These results indicate that our model can explain the coexistence of the neutral scattering and silicate feature with no tuning of the size distribution or compositions of dust particles. The visible absorption cross sections are also higher compared with the mass-equivalent sphere due to the enhancement of geometrical cross section, while the absorption cross sections in the mid infrared are comparable. These properties are also consistent with the observed superheat and high albedo of the dust particles in the beta Pic disk.

Author

Optical Properties; Stellar Envelopes; Size Distribution; Infrared Astronomy; Cosmic Dust

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The exo-zodiacal disk mapper

Petro, Larry, Space Telescope Science Inst., USA; Bely, P., Space Telescope Science Inst., USA; Burg, R., Johns Hopkins Univ., USA; Wade, L., Jet Propulsion Lab., California Inst. of Tech., USA; Beichman, C., Jet Propulsion Lab., California Inst. of Tech., USA; Gay, J., Observatoire de la Cote d'Azur, France; Baudoz, P., Observatoire de la Cote d'Azur, France; Rabbia, Y., Observatoire de la Cote d'Azur, France; Perrin, J. M., Laboratoire d'Astronomie Spatiale, France; Exozodiacal Dust Workshop; Apr. 1998, pp. 287; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Zodiacal dust around neighboring stars could obscure the signal of terrestrial planets observed with the Terrestrial Planet Finder (TPF) if that dust is similar to that in the Solar System. Unfortunately, little is known about the presence, or frequency of occurrence of zodiacal dust around stars and so the relevance of zodiacal dust to the design of the TPF, or to the TPF mission, is unknown. It is likely that direct observation of zodiacal dust disks will be necessary to confidently determine the characteristics of individual systems. A survey of a large number of stars in the solar neighborhood that could be candidates for observation with TPF should be undertaken. We present a concept for a space mission to undertake a sensitive, large-scale survey capable of characterizing solar-system-like zodiacal dust around 400 stars within 20 pc of the Sun.

Derived from text

Zodiacal Dust; Solar Neighborhood; Interferometers; Stellar Envelopes

19980219294 California Univ., San Diego, CA USA

Instrumentation for the VLT interferometer

Quirrenbach, Andreas, California Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 288; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Four instruments are currently foreseen to form the initial instrumentation complement for the Very large Telescope array on Cerro paranao in Chile. These are: (1) a near-IR test instrument; (2) a near-IR closure phase instrument; (3) a near-IR dual-feed instrument for narrow angle astrometry and phase referenced imaging; and (4) a mid-IR instrument. The discussion of each is presented.
CASI
Infrared Interferometers; Very Large Array (VLA); Astrometry; Infrared Telescopes; Astronomical Interferometry

19980219295 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The HST T tauri star SNAPshot survey
Stapelfeldt, Karl, Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 289-290; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

In the nearest star-forming regions, protoplanetary disks have angular sizes of only 3-4". Millimeter interferometry has generally been limited to a resolution of 1". Groundbased coronagraphic imaging of YSOs has been restricted to radii exterior to an occulting mask (r >2"), and detect nebulosity only in the most extreme dusty systems. The Hubble Space Telescope (HST) is the only observatory which can provide a spatial resolution of approx. 10 AU in combination with a stable point-spread function for high dynamic range imaging at visual wavelengths. Since the December 1993 servicing mission, only 12 nearby young stars have been observed by HST with the sensitivity needed to detect circumstellar reflection nebulosity. All six of the classical T Tauri stars observed so far have shown nebulosity; three objects are compact bipolar nebulae without an optically visible star; and the three weak-line T Tauri stars observed show no evidence for circumstellar nebulosity. Disks have been directly observed in 3 of the 12 systems studied so far: HH 30, GM Aurigae, and Haro 6-5B. A larger survey offers the prospect of many more detections, and thereby can address such fundamental questions as: What is the frequency for direct detection of disks around premain sequence stars? What is the range of disk masses and sizes? How are disks different in binary systems? Our proposal for an HST T Tauri Star SNAPshot survey was approved for 75 targets in Cycle 7. A SNAPshot survey consists of short-duration (25 minutes or less) sequences of observations which can be used to fill gaps in the HST observing schedule. This is well-matched to the needs of disk imaging, where typical T Tauri stars (11 <V band R and I images will be taken.
Author
Stellar Envelopes; T Tauri Stars; Microwave Interferometers; Microwave Imagery; Sky Surveys (Astronomy)

19980219296 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Space Interferometry Mission
Unwin, Stephen C., Jet Propulsion Lab., California Inst. of Tech., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 291; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

The Space Interferometry Mission (SIM) is the next major space mission in NASA's Origins program after SIRTF. The SIM architecture uses three Michelson interferometers in low-earth orbit to provide 4 microarcsecond precision absolute astrometric measurements on approx. 40,000 stars. SIM will also provide synthesis imaging in the visible waveband to a resolution of 10 milliarcsecond, and interferometric nulling to a depth of 10(exp -4). A near-IR (1-2 micron) capability is being considered. Many key technologies will be demonstrated by SIM that will be carried over directly or can be readily scaled to future Origins missions such as TPF. The SIM spacecraft will carry a triple Michelson interferometer with baselines in the 10 meter range. Two interferometers act as high precision trackers, providing attitude information at all time, while the third one conducts the science observations. Ultra-accurate laser metrology and active systems monitor the systematic errors and to control the instrument vibrations in order to reach the 4 microarcsecond level on wide-angle measurements. SIM will produce a wealth of new astronomical data. With an absolute positional precision of 4 microarcsecond, SIM will improve on the best currently available measures (the Hipparcos catalog) by 2 or 3 orders of magnitude, providing parallaxes accurate to 10% and transverse velocities to 0.2 km/s anywhere in the Galaxy, to stars as faint as 20th magnitude. With the addition of radial velocities, knowledge of the 6-dimension phase space for objects of interest will allow us to attack a wide array of previously inaccessible problems such as: search for planets down to few earth masses; calibration of stellar luminosities and by means of standard candles, calibration of the cosmic distance scale; detecting perturbations due to spiral arms, disk warps and central bar in our galaxy; probe of the gravitational potential of the Galaxy, several kiloparsecs out of the galactic plane; synthesis imaging of circumstellar disks around young stellar objects; imaging the narrow-line regions of AGNs in the optical; direct distance determination of a half dozen nearby spiral galaxies using rotational kinematics, thereby sidestepping reddening and metallicity issues in the calibration of distance estimators like Tully-Fisher; imag-

ing exozodiacal dust disks (when operating in its nulling mode, SIM will be sensitive, at a distance of (beta) Pic (20 pc), to scales ranging from 0.2 to 5 AU).
Author
Michelson Interferometers; Astronomical Interferometry; Space Missions; Astronomical Photometry

19980219297 Arizona Univ., Steward Observatory, Tucson, AZ USA
TPF precursors and exo-zodiacal emission
Woolf, Neville J., Arizona Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 292; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Is there a configuration which matches the potential scientific and technical interest in a planet finder precursor? There were many telescopes in space before HST, yet we nearly blew it! There have been no interferometers in space before SIM and DS3 and neither of them will be much like TPF. We have never previously attempted to control a long floppy structure so precisely. And we have never attempted to get control information so precisely, to get phase and amplitude precision correct to a fraction of 1/10 of 1%. It would be helpful if a smaller, faster, simpler, cheaper version of TPF could be tried first. Likewise the angular resolution of a planet finder, and its ability to explore very faint regions not far from very bright sources is a new kind of tool for astronomy. There would seem to be an opportunity to make some kind of novel astronomy study simultaneously with making the technical advance. What would a precursor be like that attempted to measure exo-zodiacal emission (EZE), and what else might be done with such a device? A precursor would be at 1 AU, and would have only two mirrors, approx. 15 m apart. There is no need to make them more than 1 m diameter despite the strong solar system zodiacal background. To avoid radiation from Sun, Earth, and Moon in different directions, it would be in a fall-away orbit like SIRTF or at L2. Passive cooling could get to 40 K, which is enough for a 5 micron InSb detector but not for sensitive 10 micron observations. Detector cooling is one version of the price of making a precursor detect EZE. Alternatively, we might try to detect the EZE at 5 microns, where the strongest signal will come from about 0.4 AU from the star. However, 2-element interferometers ”leak” starlight because they partially resolve a star, and a 2-element interferometer to see emission 0.4 AU from a star would leak too much radiation from a star 0.01 AU diameter. The 5 micron EZE is relatively fainter relative to the star radiation, and at 10 microns the leak is less important compared with solar system ZE. So an alternative ”price” to detector cooling at 10 microns is a 4-element interferometer with ambient detector at 5 microns. Neither is a simplest, cheapest approach. In terms of current lack of experience, the cooled detector seems the preferable approach. Such a device would also be able to detect the radiation of giant planets of approx. 100 million years old, where the system dust had largely gone. Such planets could be found around stars of the Pleiades cluster or nearby star formation regions.
Author
Zodiacal Light; Signal Detection; Terrestrial Planets; Space Missions; Spaceborne Telescopes; Infrared Interferometers

19980219298 Florida Univ., Dept. of Astronomy, Gainesville, FL USA
Observational consequences of dynamical structure in exozodis
Wyatt, M. C., Florida Univ., USA; Dermott, S. F., Florida Univ., USA; Grogan, K., Florida Univ., USA; Jayaraman, S., Vanguard Research, Inc., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 293-294; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The inadequacy of empirical models of the zodi led the solar system dynamics group at the University of Florida to develop a model of the cloud which accounts for the dominant physical processes acting on the constituent dust particles. In the modeling, the complete dynamical evolution of the particles is followed from source to sink, including the effects of gravitational perturbations of seven planets, radiation pressure, Poynting-Robertson drag and solar wind drag. This process is carried out independently for particles originating from different sources and an understanding of the principle dynamics relevant in each case allows us to obtain the three-dimensional distribution of the surface area of dust in the cloud. These models have been tested by comparing the integrated flux from dust in the model with actual observations. Comparison with IRAS and COBE observations has proven the method to be extremely effective and has shown it to be fundamental in both understanding the observed structure, and in placing constraints on the origin of the zodi. This technique can easily be expanded to model hypothetical exozodis with hypothetical sources, physical conditions and dust properties.
Author
Zodiacal Dust; Astronomical Models; Solar System

19980219383 Chicago Univ., Enrico Fermi Inst., Chicago, IL USA
Far-Infrared Astronomy with The Kuiper Airborne Observatory ***Interim Report, 1 Dec. 1974 - 31 Oct. 1997***
Hildebrand, Roger, H., Chicago Univ., USA; 1997; 8p; In English
Contract(s)/Grant(s): NsG-2057; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report summarizes work made possible by NASA's Kuiper Airborne Observatory. The results of the work have appeared in over 80 papers. The publications fall in three main areas: instrumentation, observations, and analysis. Although there is considerable overlap between these categories it will be convenient to group them separately.
Author
Bibliographies; Far Infrared Radiation; Astronomy

19980219480 Smithsonian Astrophysical Observatory, Cambridge, MA USA
A Normal Incidence X-ray Telescope (NIXT) Sounding Rocket Payload ***Final Report, 1 Aug. 1984 - 31 Mar. 1998***
Golub, Leon, Smithsonian Astrophysical Observatory, USA; Astrophysics and Space Science; Jul. 1998; Volume 237, pp. 33-48; In English
Contract(s)/Grant(s): NAG5-626; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The solar corona, and the coronae of solar-type stars, consist of a low-density magnetized plasma at temperatures exceeding 10(exp 6) K. The primary coronal emission is therefore in the UV and soft X-ray range. The observed close connection between solar magnetic fields and the physical parameters of the corona implies a fundamental role for the magnetic field in coronal structuring and dynamics. Variability of the corona occurs on all temporal and spatial scales - at one extreme, as the result of plasma instabilities, and at the other extreme driven by the global magnetic flux emergence patterns of the solar cycle.
Author
X Ray Telescopes; Solar Magnetic Field; Sounding Rockets; Solar Corona; Payloads

19980220239 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Astrometric Detection of Extrasolar Planets: Results of a Feasibility Study with the Palomar 5 Meter Telescope
Pravdo, Steven H., Jet Propulsion Lab., California Inst. of Tech., USA; Shaklan, Stuart B., Jet Propulsion Lab., California Inst. of Tech., USA; The Astrophysical Journal; Jul. 01, 1996; Volume 465, pp. 264-277; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The detection of extrasolar planets around stars like the Sun remains an important goal of astronomy. We present results from Palomar 5 m observations of the open cluster NGC 2420 in which we measure some of the sources of noise that will be present in an astrometric search for extrasolar planets. This is the first time that such a large aperture has been used for high-precision astrometry. We find that the atmospheric noise is 150 micro-arcsec hr(exp 1/2) across a 90 sec field of view and that differential chromatic refraction (DCR) can be calibrated to 128 micro-arcsec for observations within 1 hr of the meridian and 45 deg of zenith. These results confirm that a model for astrometric measurements can be extrapolated to large apertures. We demonstrate, based upon these results, that a large telescope achieves the sensitivity required to perform a statistically significant search for extra solar planets. We describe an astrometric technique to detect planets, the astrometric signals expected, the role of reference stars, and the sources of measurement noise: photometric noise, atmospheric motion between stars, sky background, instrumental noise, and DCR. For the latter, we discuss a method to reduce the noise further to 66 micro-arcsecond for observations within 1 hr of the meridian and 45 deg of zenith. We discuss optimal lists of target stars taken from the latest Gliese & Jahreiss catalog of nearby stars with the largest potential astrometric signals, declination limits for both telescope accessibility and reduced DCR, and galactic latitude limits for a sufficiant number of reference stars. Two samples are described from which one can perform statistically significant searches for gas giant planets around nearby stars. One sample contains 100 ”solar class” stars with an average stellar mass of 0.82 solar mass; the other maximizes the number of stars, 574, by searching mainly low-mass M stars. We perform Monte Carlo simulations of the statistical significance of the expected results by using measured and estimated noise quantities. We show the semimajor axis parameter spaces that are searched for each star and how an increase in the length of the observing program expands these spaces. The search over semimajor axis parameter space relates to the theory of gas giant planet formation.
Author
Planetary Evolution; Planetary Systems; Feasibility Analysis; Noise Reduction; Background Noise; Extrasolar Planets; M Stars

19980220240 Johns Hopkins Univ., Baltimore, MD USA
NIRAS: A Proposal for a Near Infrared Astronomical Survey Mission
Burg, R., Johns Hopkins Univ., USA; Bely, P., Space Telescope Science Inst., USA; Madau, Piero, Space Telescope Science Inst., USA; McLean, Brian, Space Telescope Science Inst., USA; Noll, Keith, Space Telescope Science Inst., USA; Stiavelli, Massimo, Space Telescope Science Inst., USA; Science with the NGST ASP Conference Series; 1998; Volume 133, pp. 221-226; In English
Contract(s)/Grant(s): NAGw-2508; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We propose that a 1/10 scale model of NGST equipped with extensive technical instrumentation, and a near infrared and mid infrared camera be launched to L2 to serve as a technical validation of the overall concept while providing useful science in support

of NGST's scientific program. After a 3 month period for technical investigations, the spacecraft would be used for one year to perform wide angle surveys in the near and mid infrared.
Author
Near Infrared Radiation; Scale Models; Proving

19980220241 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Searching for Exo-Zodiacal Discs with a Rotation Shearing Interferometer for NGST
Burg, R., Johns Hopkins Univ., USA; Bely, P. Y., Space Telescope Science Inst., USA; Petro, L., Space Telescope Science Inst., USA; Gay, J., Observatoire de la Cote d'Azur, France; Rabbia, Y., Observatoire de la Cote d'Azur, France; Baudoz, P., Observatoire de la Cote d'Azur, France; Redding, D., Jet Propulsion Lab., California Inst. of Tech., USA; Science with the NGST ASP Conference Series; 1998; Volume 133, pp. 214-219; In English
Contract(s)/Grant(s): NAGw-2508; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The detection of exo-zodiacal discs is an important step in the NASA program for the detection of exo-solar planet, in particular, the detection of earth-like planets. We show that by incorporating a nulling interferometer NGST would be very well suited to study exo-zodiacal disks in nearby stars. Over 400 stars could be surveyed and at least 40 could be resolved such that structural parameters on the 2-3 AU scale could be measured. This can be done within the existing optical NGST design but demands a wavefront RMS error less than lambda/100 at 10 microns in order to assure a wavefront cancellation of 1000.
Author
Observation; Planets; Optical Equipment; Design Analysis; Zodiacal Light

19980220388 Astrophysikalisches Inst., Potsdam Germany
The ROSAT Deep Survey
Hasinger, G., Astrophysikalisches Inst., Germany; Burg, R., Johns Hopkins Univ., USA; Giacconi, R., European Southern Observatory, Germany; Schmidt, M., California Inst. of Tech., USA; Truemper, J., Max-Planck-Inst. fuer Extraterrestrische Physik, Germany; Zamorani, G., Istituto di Radioastronomia, Italy; Astronomy and Astrophysics; Sep. 15, 1997; ISSN 0004-6361, pp. 1-14; In English
Contract(s)/Grant(s): DARA-FKZ-50-OR-94035; ASI-95-RS-152; NAGw-2508; NAG5-1531; NAG8-794; NAG5-1649; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The ROSAT Deep Survey in the Lockman Hole is the most sensitive X-ray survey performed to date, encompassing an exposure time of 207 K sec with the PSPC and a total of 1.32 Msec with the HRI aboard ROSAT. Here we present the complete catalogue of 50 X-ray sources with PSPC fluxes (0.5-2 keV) above 5.5 x 10(exp -15) erg/sq cm s. The optical identifications are discussed in an accompanying paper. We also derive a new log(N)-log(S) function reaching a source density of 970 +/- 150/ deg(exp 2) at a limiting flux of 10(exp -15) erg/sq cm s. At this level 70-80% of the 0.5-2 keV. X-ray background is resolved into discrete sources. Utilizing extensive simulations of artificial PSPC and HRI fields we discuss in detail the effects of source confusion and incompleteness both on source counts and on optical identifications Based on these simulations we set conservative limits on flux and on off-axis angles, which guarantee a high reliability of the catalogue. We also present simulations of shallower fields and show that surveys, which are based on PSPC exposures longer than 50 ksec, become severely confusion limited typically a factor of 2 above their 4(sigma) detection threshold. This has consequences for recent claims of a possible new source population emerging at the faintest X-ray fluxes.
Author
X Rays; Surveys; ROSAT Mission; X Ray Sources

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19980218966 NASA Ames Research Center, Moffett Field, CA USA
Nucleosynthesis and the Isotopic Composition of Stardust
Tielens, Alexander G. M., NASA Ames Research Center, USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 1-28; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Various components have been isolated from carbonaceous meteorites with an isotopically anomalous elemental composition. Several of these are generally thought to represent stardust containing a nucleosynthetic record of their birthsites. This paper

discusses the expected isotopic composition of stardust based upon astronomical observations and theoretical studies of their birthsites: red giants and supergiants, planetary nebulae, C-rich Wolf-Rayet stars, novae and supernovae. Analyzing the stardust budget, it is concluded that about 15% of the elements will be locked up in stardust components in the interstellar medium. This stardust will be isotopically heterogenous on an individual grain basis by factors ranging from 2 to several orders of magnitude. Since comets may have preserved a relatively unprocessed record of the stardust entering the solar nebula, isotopic studies of returned comet samples may provide valuable information on the nucleosynthetic processes taking place in the interiors of stars and the elemental evolution of the Milky Way.
Author
Interstellar Matter; Nuclear Fusion; Comets; Carbonaceous Meteorites; Isotope Ratios; Interstellar Chemistry; Meteoritic Composition; Stellar Evolution; Stellar Composition

19980218967 Wisconsin Univ., Washburn Observatory, Madison, WI USA
Interstellar and Cometary Dust
Mathis, John S., Wisconsin Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 29-57; In English; Also announced as 19980218965
Contract(s)/Grant(s): JPL-957996; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

'Interstellar dust' forms a continuum of materials with differing properties which I divide into three classes on the basis of observations: (a) diffuse dust, in the low-density interstellar medium; (b) outer-cloud dust, observed in stars close enough to the outer edges of molecular clouds to be observed in the optical and ultraviolet regions of the spectrum, and (c) inner-cloud dust, deep within the cores of molecular clouds, and observed only in the infrared by means of absorption bands of C-H, C=O, 0-H, C(triple bond)N, etc. There is a surprising regularity of the extinction laws between diffuse- and outer-cloud dust. The entire mean extinction law from infrared through the observable ultraviolet spectrum can be characterized by a single parameter. There are real deviations from this mean law, larger than observational uncertainties, but they are much smaller than differences of the mean laws in diffuse- and outer-cloud dust. This fact shows that there are processes which operate over the entire distribution of grain sizes, and which change size distributions extremely efficiently. There is no evidence for mantles on grains in local diffuse and outer-cloud dust. The only published spectra of the star VI Cyg 12, the best candidate for showing mantles, does not show the 3.4 micro-m band which appreciable mantles would produce. Grains are larger in outer-cloud dust than diffuse dust because of coagulation, not accretion of extensive mantles. Core-mantle grains favored by J. M. Greenberg and collaborators, and composite grains of Mathis and Whiffen (1989), are discussed more extensively (naturally, I prefer the latter). The composite grains are fluffy and consist of silicates, amorphous carbon, and some graphite in the same grain. Grains deep within molecular clouds but before any processing within the solar system are presumably formed from the accretion of icy mantles on and within the coagulated outer-cloud grains. They should contain a mineral/carbonaceous matrix, without organic refractory mantles, in between the ices. Unfortunately, they may be significantly processed by chemical processes accompanying the warming (over the 10 K of the dark cloud cores) which occurs in the outer solar system. Evidence of this processing is the chemical anomalies present in interplanetary dust particles collected in the stratosphere, which may be the most primitive materials we have obtained to date. The comet return mission would greatly clarify the situation, and probably provide samples of genuine interstellar grains.
Author
Interplanetary Dust; Comets; Micrometeorites; Ultraviolet Spectra; Absorption Spectra; Stellar Composition; Grain Size; Interstellar Chemistry; Comet Nuclei; Diffuse Interstellar Bands

19980218968 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA
Refractory Solids in Chondrites and Comets: How Similar?
Wood, John A., Harvard-Smithsonian Center for Astrophysics, USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 59-71; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The raw materials of the solar system were interstellar gas, grains of ice, refractory dust, and organic material. Gravitational collapse caused these ingredients to fall together into a protosun and accretion disk (the solar nebula), out of which the planetary system grew. The raw materials have been preserved to differing degrees in the most primitive solar system bodies, asteroids and comets. The present paper deals mostly with the state of preservation of one of the primordial ingredients, the refractory dust. The study of samples of asteroids, in the form of chondritic meteorites, reveals that the dust component in the inner solar system was extensively altered by high-temperature events and processes before it was aggregated into chondritic planetesimals. The chondritic material was further altered by metamorphic heating in its parent planetesimals after accretion.
Author
Comets; Chondrites; Refractory Materials; Asteroids; Solar System; Solids; Interstellar Chemistry; Interstellar Matter; Meteoritic Composition; Planetary Composition

19980218969 Max-Planck-Inst. fuer Chemie, Abteilung Kosmochemie, Mainz, Germany

Disequilibrium Chemistry in the Solar Nebula and Early Solar System: Implications for the Chemistry of Comets

Fegley, Bruce, Jr., Max-Planck-Inst. fuer Chemie, Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 73-91; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

A growing body of observations demonstrates that comets, like the chondritic meteorites, are disequilibrium assemblages, whose chemistry and molecular composition cannot be explained solely on the basis of models of equilibrium condensation in the solar nebula. These observations include: (1) The coexistence of reduced (e.g., CH4 and organics) and oxidized (e.g., CO, CO2, and H2CO) carbon compounds observed in the gas and dust emitted by comet P/Halley; (2) The coexistence of reduced (e.g., NH3) and oxidized (e.g., N2) nitrogen compounds in the gas emitted by comet P/Halley; (3) The observation of large amounts of formaldehyde in the gas emitted by comet P/Halley (H2CO/H2O approx. 1.5 - 4%) and by comet Machholz (1988j). Formaldehyde would be rapidly destroyed by thermal processing in the solar nebula and must be formed by some disequilibrating process either in the solar nebula or in some presolar environment. (4) The observation of large amounts of the oxidized carbon gases CO and CO2 in comet P/Halley at levels far exceeding those predicted by chemical equilibrium models of solar nebula carbon chemistry. In fact, oxidized carbon gases (CO+ C02 + H2CO) are the most abundant volatile (after water vapor) emitted by comet P/Halley. (5) The observation of HCN, which is not a predicted low temperature condensate in the solar nebula (e.g., Lewis 1972), in comet P/Halley (e.g., Schloerb et al. 1987) and in comet Kohoutek. (6) The observation of S2, which is argued to be a parent molecule vaporized from the nucleus, in comet IRAS-Araki-Alcock (1983d) by A'Hearn et aL (1983) and Feldman et al. (1984). This molecule is not an equilibrium condensate in the solar nebula and must result from disequilibrium chemistry. (7) The deduction that organic grains (C-H-O-N particles) comprise about 30% of the dust emitted by comet P/Halley and that about 75% of the total carbon inventory of Halley is in these grains also implies substantial disequilibrium chemistry. (8) The deductions that polyoxymethylene (polymerized formaldehyde or POM) is a constituent of the C- H-O-N particles emitted from comet P/Halley (e.g., Huebner 1987; Huebner et aL 1987; Mitchell et al. 1987). If actually present in the C-H-O-N particles, POM is also a product of disequilibrating processes which took place in the solar nebula and/or in a presolar environment. Taken together, the observations listed above indicate that a variety of disequilibrating processes such as the kinetic inhibition of thermochemical reactions, grain catalyzed chemistry, lightning induced shock chemistry, and photochemistry played an important role in establishing the chemistry and molecular composition of comet P/Halley in particular and presumably cometary material in general. However, the observational data do not by themselves constrain the timing and/or location of these various processes. This paper reviews the relevant observational data and attempts to quantify as far as possible by using current theoretical models and experimental data the relative importance of equilibrium and disequilibrium processes for the chemistry of comets. "Key" experimental and observational measurements which are important for better constraints on cometary origins are proposed. Finally, important measurements to be made by a comet nucleus sample return mission such as Rosetta are also suggested.

Author

Nebulae; Solar System; Planetary Nebulae; Comets; Chondrites; Chemical Equilibrium; Interstellar Chemistry; Stellar Evolution; Interplanetary Dust; Chemical Composition; Halley"S COMET

19980218970 Maryland Univ., College Park, MD USA

Sulfur Compounds in Comets

Kim, Sang J., Maryland Univ., USA; AHearn, Michael F., Maryland Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 93-102; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Cometary comae exhibit abundant sulfur and sulfur compounds, most of which are absent in planetary atmospheres. Sulfur compounds have also been detected in the interstellar medium, including SO, SO2, CS, etc., but excluding S2 which was identified only in comet IRAS-Araki-Alcock (IAA) 1983d. The study of the origin and parent molecules of these compounds, therefore, may yield a clue to the question of the formation and evolution of comets from the interstellar medium. Our work is aimed at determining abundances of the various sulfur compounds in comets.

Author

Interstellar Matter; Iras-Araki-Alcock Comet; Molecules; Sulfur Compounds; Irradiation; Solar Radiation; Interstellar Chemistry; Chemical Composition

19980218971 Southwest Research Inst., San Antonio, TX USA

Spectrophotometric Observations of Comet P/Giacobini-Zinner

Konno, Ichishiro, Southwest Research Inst., USA; Wyckoff, Susan, Arizona State Univ., USA; Wehinger, Peter A., Arizona State Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 103-118; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Spectrophotometric observations of Comet P/Glacobini-Zinner were obtained in March, June, September, and October 1985. The September observations were obtained at perihelion, exactly at the time of the International Cometary Explorer (ICE) encounter with the comet. Spatial profiles extracted from the long-slit spectra were analyzed by using a Monte Carlo method to determine scale lengths and lifetimes for the observed radicals, C2 and NH2, and their respective parent molecules. The scale length for the parent of C2 was found to be (7.5 +/- 1.5)x10(exp 4) km and for the parent of NH2 (2.4 +/- 0.4)x10(exp 4) km. The brightness profile of C2 and the lifetime of the parent of C2 indicate that C2 probably comes from many different sources which may include C2H4, C2H2, and dust particles. C2 and NH2, were found to be depleted in Giacobini-Zinner relative to an average comet by factors of 10 and 5, respectively. The water production rate was obtained for June, September, and October observations from the measurements of the [O I] 6300 A line. The water production rate at the time of the ICE encounter was found to be 2.4x10(exp 28) molecules/s, in good agreement with spacecraft results.
Author
Giacobini-Zinner Comet; Spectrophotometry; Astronomical Observatories; Molecules; Emission Spectra; Water; Chemical Composition

19980218972 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Physical Processing of Cometary Nuclei
Weissman, Paul R., Jet Propulsion Lab., California Inst. of Tech., USA; Stern, S. Alan, Colorado Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 119-166; In English; Also announced as 19980218965
Contract(s)/Grant(s): NGT-50236; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Cometary nuclei preserve a cosmo-chemical record of conditions and processes in the primordial solar nebula, and possibly even the interstellar medium. However, that record is not perfectly preserved over the age of the solar system due to a variety of physical processes which act to modify cometary surfaces and interiors. Possible structural and/or internal processes include: collisional accretion, disruption, and reassembly during formation; internal heating by long and short-lived radionuclides; amorphous to crystalline phase transitions, and thermal stresses. Identified surface modification processes include: irradiation by galactic cosmic rays, solar protons, UV photons, and the Sun's T Tauri stage mass outflow; heating by passing stars and nearby supernovae; gardening by debris impacts; the accretion of interstellar dust and gas and accompanying erosion by hypervelocity dust impacts and sputtering; and solar heating with accompanying crust formation. These modification processes must be taken into account in both the planning and the interpretation of the results of a Comet Nucleus Sample Return Mission. Sampling of nuclei should be done at as great a depth below the surface crust as technically feasible, and at vents or fissures leading to exposed volatiles at depth. Samples of the expected cometary crust and near-surface layers also need to be returned for analysis to achieve a better understanding of the effects of these physical processes. We stress that comets are still likely less modified dm any other solar system bodies, but the degree of modification can vary greatly from one comet to the next.
Author
Comet Nuclei; Interstellar Matter; Solar System; Comets; Samples; Supernovae; Planetary Nebulae; Interstellar Chemistry

19980218973 Ingenieurbuero Krueger, Darmstadt, Germany
The Organic Matter of Comet P/Halley as Inferred by Joint Gas and Solid Phase Analysis
Krueger, F. R., Ingenieurbuero Krueger, Germany; Korth, A., Max-Planck-Inst. fuer Aeronomie, Germany; Kissel, J., Max-Planck-Inst. fuer Kernphysik, Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 167-181; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

During the encounters with comet Halley, PICCA on GIOTTO measured the gas phase organic ion composition of the coma, and PUMA on VEGA 1 measured the dust composition. Joining those results a consistent picture of the parent organic matter from which dust and gas is produced can be obtained. One recognizes a complex unsaturated polycondensate, which splits during coma-formation into the more refractory C=C,C-N-containing dust part, and the more volatile C=C,C-O-containing gas part. The responsible exothermal chemical reactions, triggered by the sun light may play a major role in the dynamics of coma formation. The latent heat and reactivity may cause problems regarding a sample return mission.
Author
Halley"S COMET; Organic Materials; Cosmic Dust; Molecular Ions; Mass Spectroscopy; Heavy Ions; Solid Phases

19980218974 Rutgers Univ., New Brunswick, NJ USA
On the Measurement of Cosmogenic Radionuclides in Cometary Materials
Herzog, G. F., Rutgers Univ., USA; Englert, P. A. J., San Jose State Univ., USA; Reedy, R. C., Los Alamos National Lab., USA; Nishiizumi, K., California Univ., USA; Kohl, C. P., California Univ., USA; Arnold, J. R., California Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 183-198; In English; Also announced as 19980218965; No Copyright; Avail:

CASI; A03, Hardcopy; A04, Microfiche

Determinations of the cosmogenic nuclide concentrations in cometary material will help to define the recent surface history of the comet and its exposure to cosmic rays. In particular, the rates for the removal or mixing of surface material could be studied, and any variations in cosmic-ray intensity implied by the data could be used to infer orbital changes during the last few million years. The measurement of the shorter-lived isotopes poses technical challenges that should be addressed now. The measurement of longer-lived isotopes will be straightforward provided that rates of mass loss are not too high.
Author

Comets; Cosmic Rays; Radioactive Isotopes; Comet Nuclei; Chemical Analysis

19980218975 Southwest Research Inst., San Antonio, TX USA

Morphology and Compositional Differentiation of the Surface of Comets

Huebner, W. F., Southwest Research Inst., USA; Boice, D. C., Southwest Research Inst., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 199-204; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Giotto images reveal many features on the nucleus of Comet Halley, including gas- and dust-producing sources surrounded by an inactive region. In the inactive region, crater-like structures can be seen that may be extinct sources. These structures may develop by surface erosion of an active area and deposition of some excavated material on the periphery, creating crater-like rims. These rims are formed from ”clumps” of comet regolith that can be lifted by the escaping gas. The lack of lift caused by the divergence of the gas flow near the boundary of an active region lets them fall back on the nucleus and create a rim. This may be a continuous process during perihelion passage. Supplementing the original concept of investigating the active and inactive regions, we conclude that three compositionally distinct areas should be sampled during the Rosetta mission: (1) The active regions rich in frozen gases and unprocessed dust; (2) The inactive region covered by a thin layer of fine dust enriched in organics that may be sintered. (3) The crater-like rims containing ”clumps” of processed organics, silicates, and trapped frozen gases.
Author

Comet Nuclei; Halley”S COMET; Galactic Structure; Morphology; Dust; Gases

19980218976 Kent Univ., Unit for Space Sciences, Canterbury, UK

The In-Situ Particulate Size Distribution Measured for One Comet: P/Halley

McDonnell, J. A. M., Kent Univ., UK; Pankiewicz, G. S., Kent Univ., UK; Birchley, P. N. W., Kent Univ., UK; Green, S. F., Kent Univ., UK; Perry, C. H., Kent Univ., UK; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 205-215; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The comet Halley dust mass distribution measured by the Giotto DIDSY and PIA experiments is used to derive the dust to gas mass ratio micro for the nucleus material. The excess of grains observed for masses greater than 10(exp -9) kg places micro in the range 1-200 if the observed size distribution is representative of the average properties of the coma. The lower bound corresponds to integration up to the largest particle (approx. 1g) impacting Giotto. The mass and area distributions at the nuclear surface for distributions with and without this large particle excess are compared.
Author

Comet Nuclei; Particle Size Distribution; Mass Distribution; Halley”S COMET; Cosmic Dust; Particulates; Absorbers (Materials)

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Organic Chemistry in Interstellar Ices: Connection to the Comet Halley Results

Schutte, W. A., NASA Ames Research Center, USA; Agarwal, V. K., Rensselaer Polytechnic Inst., USA; deGroot, M. S., Leiden Univ., Netherlands; Greenberg, J. M., Leiden Univ., Netherlands; McCain, P., Rensselaer Polytechnic Inst., USA; Ferris, J. P., Rensselaer Polytechnic Inst., USA; Briggs, R., New York State Dept. of Health, USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 217-224; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Mass spectroscopic measurements on the gas and dust in the coma of Comet Halley revealed the presence of considerable amounts of organic species. Greenberg (1973) proposed that prior to the formation of the comet UV processing of the ice mantles on grains in dense clouds could lead to the formation of complex organic molecules. Theoretical predictions of the internal UV field in dense clouds as well as the discovery in interstellar ices of species like OCS and OCN- which have been formed in simulation experiments by photoprocessing of interstellar ice analogues point to the importance of such processing. We undertook a labo-

ratory simulation study of the formation of organic molecules in interstellar ices and their possible relevance to the Comet Halley results.
Derived from text
Interstellar Chemistry; Organic Materials; Photolysis; Ice; Halley"S COMET; Mass Spectroscopy; Molecular Clouds; Simulation

19980218978 Tennessee Univ., Knoxville, TN USA
Evolution of Carbonaceous Chondrite Parent Bodies: Insights into Cometary Nuclei?
McSween, Harry Y., Jr., Tennessee Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 225-238; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Much of the excitement about obtaining cometary samples accrues from the conventional view that they comprise the most primitive materials that we are likely to get our hands on. But is this true? Although "parent body" alteration of such samples would not necessarily detract from this interest, we should keep in mind the possibility that certain kinds of secondary processes may have affected cometary nuclei. Weissman (1986) has proposed some mechanisms by which comet nuclei might be altered, but observational evidence supporting the physical processing of comets is not yet generally available. This paper will take another approach: inferences about the kinds of modifications that might be encountered can be drawn from data on the evolution of carbonaceous chondrite parent bodies. It seems increasingly unlikely that carbonaceous chondrites are comet nucleus samples. However, these meteorites were probably derived from planetesimals that originally contained ices, though possibly in lesser proportions than comets, so the compositional distinction between carbonaceous chondrite parent bodies and comets may be one of degree. The possibility of an orbital evolution of cometary bodies into asteroidal orbits lias also been suggested. For these reasons, it seems prudent to examine the processes which have affected carbonaceous chondrite parent bodies as possible analogs for the evolutionary history of comets.
Derived from text
Carbonaceous Chondrites; Comet Nuclei; Interplanetary Dust; Comets; Chemical Evolution; Ice; Interstellar Chemistry

19980218979 Centre National de la Recherche Scientifique, Service d'Aeronomie, Verrieres-Le Buisson, France
Interplanetary Dust Particles Optical Properties: A Clue to Cometary Dust Structure?
Levasseur–Regourd, A. C., Centre National de la Recherche Scientifique, France; Dumont, R., Bordeaux 2 Univ., France; Renard, J. B., Centre National de la Recherche Scientifique, France; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 239-246; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Both the solar light scattered by interplanetary dust particles and the thermal plane emission from these particles have been extensively observed. Techniques of inversion of the line-of-sight brightness allow to derive local optical properties of the interplanetary dust. In the ecliptic plane near 1 au, the heliocentric gradients of local polarization, temperature, and albedo are found to be of the order, respectively, of 0.8, -0.3, and -0.7. Towards the ecliptic pole, the local polarization is found to be much smaller than in the ecliptic at the same solar distance. Also the temperature decreases faster with increasing distance than it does in the ecliptic, when an increase in bulk albedo. Some optical properties of the dust particles may be inferred from these results. They are consistent with a scenario of evolution of dark fluffy cometary grains evaporating as they spiral towards the Sun.
Author
Optical Properties; Comets; Brightness; Zodiacal Light; Optical Polarization; Zodiacal Dust

19980218980 New Mexico Univ., Dept. of Geology, Albuquerque, NM USA
Cometary Evolution: Clues on Physical Properties from Chondritic Interplanetary Dust Particles
Reitmeijer, Frans J. M., New Mexico Univ., USA; Mackinnon, Ian D. R., Queensland Univ., Australia; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 247-253; In English; Also announced as 19980218965
Contract(s)/Grant(s): NAG9-160; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The degree of diversity or similarity detected in comets depends primarily on the lifetimes of the individual cometary nuclei at the time of analysis. It is inherent in our understanding of cometary orbital dynamics and the seminal model of comet origins that cometary evolution is the natural order of events in our Solar System. Thus, predictions of cometary behaviour in terms of bulk physical, mineralogical or chemical parameters should contain an appreciation of temporal variation(s). Previously, Rietmeijer and Mackinnon [1987] developed mineralogical bases for the chemical evolution of cometary nuclei primarily with regard to the predominantly silicate fraction of comet nuclei. We suggested that alteration of solids in cometary nuclei should be expected and that indications of likely reactants and products can be derived from judicious comparison with terrestrial diagenetic environments which include hydrocryogenic and low-temperature aqueous alterations. In a further development of this concept, Rietmeijer [1988] provides indirect evidence for the formation of sulfides and oxides in comet nuclei. Furthermore, Rietmeijer [1988]

noted that timescales for hydrocryogenic and low-temperature reactions involving liquid water are probably adequate for relatively mature comets, e.g. P/comet Halley. In this paper, we will address the evolution of comet nuclei physical parameters such as solid particle grain size, porosity and density. In natural environments, chemical evolution (e.g. mineral reactions) is often accompanied by changes in physical properties. These concurrent changes are well-documented in the terrestrial geological literature, especially in studies of sediment diagenesis and we suggest that similar basic principles apply within the upper few meters of active comet nuclei. The database for prediction of comet nuclei physical parameters is, in principle, the same as used for the proposition of chemical evolution. We use detailed mineralogical studies of chondritic interplanetary dust particles (IDPS) as a guide to the likely constitution of mature comets traversing the inner Solar System. While there is, as yet, no direct proof that a specific sub-group or type of chondritic IDP is derived from a specific comet, it is clear that these particles are extraterrestrial in origin and that a certain portion of the interplanetary flux received by the Earth is cometary in origin. Two chondritic porous (CP) IDPS, sample numbers W701OA2 and W7029CI, from the Johnson Space Center Cosmic Dust Collection have been selected for this study of putative cometary physical parameters. This particular type of particle is considered a likely candidate for a cometary origin on the basis of mineralogy, bulk composition and morphology. While many IDPs have been subjected to intensive study over the past decade, we can develop a physical parameter model on only these two CP IDPs because few others have been studied in sufficient detail.

Author

Interplanetary Dust; Morphology; Chondrites; Comet Nuclei; Comets; Physical Properties; Chemical Evolution

19980218981 Virginia Univ., Dept. of Nuclear Engineering and Engineering Physics, Charlottesville, VA USA

Laboratory Simulations: The Primordial Comet Mantle

Johnson, R. E., Virginia Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 255-275; In English; Also announced as 19980218965

Contract(s)/Grant(s): NAGw-186; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Laboratory data are needed to understand the formation of organics in cometary and precometary materials and for deciding on the fate of the volatiles. Appropriate experiments were described in the talk at Milipitas. Because of its importance for the comet sample return mission, I discuss here the relevance of this data for predicting the thickness, nature, and ability to survive of the cosmic-ray produced primordial comet mantle ('crust'). That part of the mantle which becomes predominantly refractory is approx. 30 gm/sq cm thick. The tensile strength of this outer mantle is such that it might survive the comet's entrance into the inner solar system. In addition, important modifications to the ices occur to depths approx. 300 gm/cu cm. Based on this it is expected that a deep probe is needed to obtain minimally altered material.

Author

Comets; Crusts; Refractories; Ice; Galactic Structure; Simulation

19980218982 NASA Goddard Space Flight Center, Greenbelt, MD USA

Metamorphism of Cosmic Dust: Processing from Circumstellar Outflows to the Cometary Regolith

Nuth, Joseph A., III, NASA Goddard Space Flight Center, USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 277-291; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Nucleation is a non-equilibrium process: the products of this process are seldom the most thermodynamically stable condensates but are instead those which form fastest. It should therefore not be surprising that grains formed in a circumstellar outflow will undergo some degree of metamorphism if they are annealed or are exposed to a chemically active reagent. Metamorphism of refractory particles continues in the interstellar medium (ISM) where the driving forces are sputtering by cosmic ray particles, annealing by high energy photons and grain destruction in supernova generated shocks. Studies of the depletion of the elements from the gas phase of the interstellar medium tell us that if grain destruction occurs with high efficiency in the ISM, then there must be some mechanism by which grains can be formed in the ISM. Various workers have shown that refractory mantles could form on refractory cores by radiation processing of organic ices. A similar process may operate to produce refractory inorganic mantles on grain cores which survived the supernova shocks. Most grains in a cloud which collapses to form a star will be destroyed; many of the surviving grains will be severely processed. Grains in the outermost regions of the nebula may survive relatively unchanged by thermal processing or hydration. It is these grains which we hope to find in comets. However, only those grains encased in ice at low temperature can be considered pristine since a considerable degree of hydrous alteration might occur in a cometary regolith if the comet enters the inner solar system. Some discussion of the physical, chemical and isotopic properties of a refractory grain at each stage of its life cycle will be attempted based on the limited laboratory data available to date. Sugges-

tions will be made concerning the types of experimental data which are needed in order to better understand the processing history of cosmic dust.
Author
Metamorphism (Geology); Nucleation; Cosmic Dust; Regolith; Comets; Interstellar Matter; Galactic Structure; Silicates; Refractories; Molecular Clouds

19980218983 Tel-Aviv Univ., Ramat-Aviv, Dept. of Geophysics and Planetary Sciences, Tel-Aviv, Israel
Experimental Studies of Gas Trapping in Amorphous Ice and Thermal Modeling of Comets: Implications for Rosetta
Bar–Nun, A., Tel-Aviv Univ., Ramat-Aviv, Israel; Prialnik, D., Tel-Aviv Univ., Ramat-Aviv, Israel; Kleinfeld, I., Tel-Aviv Univ., Ramat-Aviv, Israel; Laufer, D., Tel-Aviv Univ., Ramat-Aviv, Israel; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 293-313; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The realization that water ice at low temperatures is the major constituent of comets, the satellites of the outer planets and their rings particles, and of icy grain mantles in dense interstellar clouds, prompted in recent years a number of groups to study experimentally the properties and behavior of ice at very low temperatures and apply their findings to icy bodies. In most of these experiments, several microns to several cm thick ice samples were studied under, presumably, isothermal conditions. Thus, almost no experimental data exists on the processes by which a heat wave penetrates into the ice, the formation of a dust crust by partial water sublimation and other large scale phenomena. The works of Kajmakov, Ibadinov and their groups were aimed mainly at the formation of a filamentry residue when the ice sublimated completely, as were the works of Storrs, Fanale and Stephans. A major step in the direction of measuring bulk behavior of large (approx. 15 cm thick, approx. 30 cm diameter) ice-gas-dust samples was made in recent COSI (Comet Simulation) experiments. These results will be described by Grun in this volume. All this experimental and theoretical effort would not have led anywhere without some knowledge of the structure, composition, and behavior of icy bodies. In this field, major advances were made by the two Voyagers' flybys among the icy satellites of Jupiter, Saturn and Uranus, with Neptune yet to come. A tremendous advance in our knowledge of comets was obtained by the six spacecrafts which studied comet Halley, with Giotto and Vega contributing most of the new and surprising data. Only the combined efforts of the spacecrafts experimenters, modellists and laboratory experimenters could lead to the far better understanding of comets which we now have. The next major advances will certainly occur during the coming CRAF and ROSETTA missions. In what follows, because of space limitations, we will describe only the experimental results obtained at the Comet Simulation Laboratory of Tel Aviv University, as well as our thermal models, which incorporate the experimental results. These will be applied to the temperature and composition of the nebula in the region of comet formation; the timescale of comet formations; the small explosions observed on Comet Halley and the formation of its large active craters, as well as to Miranda's chaotic terrain; the possible contribution of comets to the noble gas inventory on the terrestrial planets and finally, to a detailed model of the thermal evolution of comet P/Temple-1.
Author
Trapping; Amorphous Materials; Ice; Comets; Interstellar Matter; Gases; Stellar Evolution; Models; Galactic Evolution

19980218984 Max-Planck-Inst. fuer Kernphysik, Heidelberg, Germany
Modification of Comet Materials by the Sublimation Process: Results from Simulation Experiments
Gruen, E., Max-Planck-Inst. fuer Kernphysik, Germany; Benkhoff, J., Westfaelische Wilhelms Univ., Germany; Bischoff, A., Westfaelische Wilhelms Univ., Germany; Dueren, H., Westfaelische Wilhelms Univ., Germany; Hellmann, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Hesselbarth, P., Max-Planck-Inst. fuer Kernphysik, Germany; Hsuing, P., Kernforschungsanlage, Germany; Keller, H. U., Max-Planck-Inst. fuer Aeronomie, Germany; Klinger, J., Centre National de la Recherche Scientifique, France; Knoelker, J., Westfaelische Wilhelms Univ., Germany; Kochan, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Neukam, G., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Oehler, A., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Roessler, K., Kernforschungsanlage, Germany; Spohn, T., Westfaelische Wilhelms Univ., Germany; Stoeffler, D., Westfaelische Wilhelms Univ., Germany; Thiel, K., Cologne Univ., Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 315-331; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sublimation experiments with Ice-mineral mixtures were carried out at the DLR Space Simulator in order to study cometary processes. First experiments were done with cylindrical samples of 30 cm diameter and iS an thickness which consisted of water-ice or water- and CO2-ice mineral mixtures. These experiments have already yielded important and new insights into the modifications of the sample which are caused by the sublimation of the ices due to insolation: (1) Spectral reflectance measurements show the reduction of volatile materials in the surface layers of the sample and the formation of a permeable refractory dust mantle, (2) the dust mantle as well as the residuals of emitted dust particles have a low density (approx. 0.1 g/cu cm) aggregate structure, (3) metamorphosis of the original non-coherent ice into hard but still porous water ice has been observed under the dust mantle, and

(4) fractionation of ices of different volatility occurs during their sublimation. A qualitative model is described which can explain the observed modifications of the sample material.
Author
Comets; Simulation; Ice; Minerals; Fractionation; Galactic Structure; Water

19980218986 Cologne Univ., Abt. Nuklearchemie, Germany
Mechanical and SEM Analysis of Artificial Comet Nucleus Samples
Thiel, K., Cologne Univ., Germany; Kochan, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Roessler, K., Forschungszentrum Juelich G.m.b.H., Germany; Gruen, E., Max-Planck-Inst. fuer Kernphysik, Germany; Schwehm, G., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Hellmann, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Hsiung, P., Forschungszentrum Juelich G.m.b.H., Germany; Koelzer, G., Cologne Univ., Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 341-352; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

In 1987 approx. 20 scientists from different disciplines started a 6 year program (KOSI) to simulate physically and chemically relevant processes of cometary nuclei. The experiments are mainly carried out in two simulation chambers of the German Aerospace Research Establishment, DLR at Cologne and FRG. Experiments in the Big Space Simulator are dedicated to effects and processes induced by artificial solar irradiation (approx. 1 solar constant) on a 30 cm diameter model comet of well-defined properties. Supporting investigations are performed in a smaller space simulation chamber with ice-dust targets of typically 10 cm diameter. Several groups of theorists who are part of the KOSI-team process the experimental results and provide relevant boundary conditions for the design of new experiments. The main objective of these studies is a better understanding of: (1) the temperature behaviour of ice-dust mixtures under given irradiation conditions; (2) the total mass and energy budget of the target; (3) the mobilization of material (dust and gas) within the target body; and (4) physical and chemical alterations of the sample as a function of the experimental parameters, especially, crust formation, gas emission, dust emission and dust properties, and gas-dust interaction. The KOSI-project is intended to allow a better interpretation of ground based and space mission gained cometary data and to support the planning of future sample return missions.
Author
Comet Nuclei; Simulation; Irradiation; Ice; Water; Mixtures; Comets; Cosmic Dust; Galactic Structure; Crusts

19980218987 Alabama Univ., Physics Dept., Birmingham, AL USA
Ion Bombardment Experiments Suggesting an Origin for Organic Particles in Pre-Cometary and Cometary Ices
Wdowiak, Thomas J., Alabama Univ., USA; Robinson, Edward L., Alabama Univ., USA; Flickinger, Gregory C., Alabama Univ., USA; Boyd, David A., Alabama Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 353-363; In English; Also announced as 19980218965
Contract(s)/Grant(s): NAGw-749; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Simple molecules frozen as mantles of interstellar and circumstellar grains and incorporated into comets are subjected to ion bombardment in the form of cosmic rays, stellar flares, stellar winds, and ions accelerated in stellar wind shocks. The total expected dosage for the variety of situations range from 10 eV/molecule for interplanetary dust subjected to solar flares to 10(exp 6) eV/molecule for material in the T Tauri environment. Utilizing a Van de Graaff accelerator and a target chamber having cryogenic and mass spectrometer capabilities, we have bombarded frozen gases in the temperature range of 10 K to 30 K with 175 keV protons. After irradiation, removal of the ice by sublimation at an elevated temperature in vacuum reveals a fluffy residue. These experiments suggest that processes resulting in the formation of organic particles found in the coma of Comet Halley, ”CHON”, may have included ion bombardment. Also, the moderate energy (100 keV to 500 keV) shock accelerated ion environment of bipolar outflow of stars in the planetary nebula stage such as the Red Rectangle, could produce complex molecular species which emit the observed unidentified infrared bands at 3.3 micro-m, 6.2 micro-m, 7.7 micro-m, 8.6 micro-m, and 11.3 micro-m.
Author
Comets; Ion Irradiation; Molecular Gases; Ice; Mass Spectroscopy; Interstellar Matter; Organic Materials; Chemical Evolution

19980218988 Max-Planck-Inst. fuer Chemie, Mainz, Germany
On the Isotope Analysis of Cometary Dust
Begemann, Friedrich, Max-Planck-Inst. fuer Chemie, Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 365-375; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Comets are still believed to be a conglomerate of ices and meteoritic dust in a ratio of about 5:1 (if we take the ratio ices/dust to be equal to the ratio gas/dust). When Whipple proposed his ”dirty snowball” model in 1950 he envisaged a single, well consolidated body; recent refinements are the icy-glue model for the cometary nucleus of Houpis and Gombosi (1986) or the ”primordial

rubble pile" of Weissman (1986). These refinements appear to pertain essentially to the macroscopic structure of the nucleus on the scale of tens of centimeters to hundreds of meters, however, so they need not concern us in the present context, since we are interested in the structure on a much smaller scale. What we should like to know is the size distribution of non-gaseous matter ("gaseous" at elevated temperatures like room temperature) which we may expect in a kg-sized sample. The most recent and most comprehensive data available on this topic are those obtained for comet Halley which may or may not be typical of comets - but then we do not know, of course, how "typical" the first returned cometary sample will be either. The understanding was that this presentation should consist of two parts, one about what one may hope to learn from the isotopic analysis in the laboratory of cometary matter, and a second part on whether present-day analytical methods are adequate to reach these goals, where improvements are required and what needs to be developed in order to optimize the scientific return. The understanding was, furthermore, that I should report on isotopics and the analysis of heavy elements and noble gases by conventional mass spectrometry, but that I should neither concern myself with light elements like H, C, O and N, nor should I deal with the potential of ion probes.
Author

Comet Nuclei; Comets; Mass Spectroscopy; Micrometeoroids; Particle Size Distribution; Cosmic Dust; Isotope Ratios

19980218989 Arizona State Univ., Tempe, AZ USA

Analysis of Organic Compounds in Returned Comet Nucleus Samples

Cronin, John R., Arizona State Univ., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 377-397; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Comets are generally believed to be primitive bodies that preserve solar system matter in, or nearly in, its primordial state. This expectation has been at least partially borne out by the 1986 flyby missions to Comet Halley which provided data indicating that, with the exception of hydrogen, the light elements (C, N, O, and S) occur in approximately their solar abundances. Although mass spectrometers carried aboard the spacecraft provided much additional data from which to speculate about the molecular forms of these elements a detailed understanding of cometary organic chemistry will ultimately require the laboratory examination of returned samples. Some of the problems that will be encountered in such studies, for example, sensitivity to trace constituents, resolution of numerous isomeric forms, and avoidance of terrestrial contaminants, have already been faced in analyses of the organic compounds from carbonaceous chondrites. Furthermore, there is reason to believe that the progenitors of the carbonaceous chondrites were volatile rich planetesimals similar to those which, at greater radial distances, formed comets. Thus, the organic chemistry of carbonaceous chondrites may represent the outcome of a process of chemical evolution that parallels, although is perhaps further advanced than, that which occurred in comets. These meteorites may then represent not only a useful model for the development and refinement of analytical methods, but also a guide to the types of organic compounds that may be encountered in analyses of cometary matter. In this paper, I have (i) briefly reviewed the results of amino acid analyses of CM chondrites, (ii) discussed the origin of these compounds and the implications for comet organic chemistry, and (iii) described some recent developments in analytical instrumentation for amino acids and their implications for analyses of extraterrestrial materials. Although the emphasis is on amino acids, their general characteristics are common to the other classes of organic compounds in CM chondrites and inferences regarding their origins should be generally relevant.
Author

Amino Acids; Carbonaceous Chondrites; Chemical Evolution; Comet Nuclei; Comets; Organic Compounds; Chemical Analysis; Samples; Galactic Evolution

19980218990 Westfaelische Wilhelms Univ., Inst. fuer Plantologie, Muenster, Germany

Concepts for the Curation, Primary Examination and Petrographic Analysis of Comet Nucleus Samples Returned to Earth

Stoeffler, D., Westfaelische Wilhelms Univ., Germany; Dueren, H., Westfaelische Wilhelms Univ., Germany; Knoelker, J., Westfaelische Wilhelms Univ., Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 399-416; In English; Also announced as 19980218965

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One of the fundamental requirements of the planned ESA/NASA Comet Nucleus Sample Return Mission (ROSETTA) is to develop concepts and instrumentations for the curation and analysis of the returned samples in an adequately equipped Receiving Laboratory. This laboratory must meet the condition that the handling, inspection, and analysis of the samples be performed at the temperature and pressure of the parental comet nucleus environment. This restriction must hold for the complete period of what may be called 'Primary Sample Examination and Analysis' (PSEA). Only after this period subsamples may be released to less restrictive environments. As foreseen in the 'Sampling and sample storage requirements" of the ROSETTA mission definition report, different types of samples will be returned in sealed containers at a temperature of less than 160 K, preferably at 130 K. The total sample mass is expected to be near 15 kg. This sampling plan which includes a 1-3 m long core sample provides a first

set of boundary conditions of a Receiving Laboratory. A second set of limiting conditions has to be derived from a ”best estimate model” of the mineralogical composition and texture of the returned samples. It is the aim of this article to help defining (a) the objectives of a Primary Sample Examination and Analysis, (b) the properties of best estimate cometary model samples, and (c) the requirements and instrumentation for PSEA with special emphasis on microscopic bulk analysis of the samples.
Author
Samples; Comet Nuclei; Sampling; Chemical Analysis; Comets; Test Facilities

19980218991 Tecnospazio S.p.A., Milan, Italy
Candidate Sample Acquisition System for the Rosetta Mission
Magnani, P. G., Tecnospazio S.p.A., Italy; Gerli, C., Tecnospazio S.p.A., Italy; Colombina, G., Tecnospazio S.p.A., Italy; Vielmo, P., Tecnomare S.p.A., Italy; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 417-431; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Comet Nucleus Sample Return (CNSR) Mission, is a cornerstone of ESA scientific program. While Giotto, Vega I and II provided the first picture of a comet nucleus, a much improved understanding of the nucleus and processes on it will result from in situ measurements and Earth based analysis of the material samples collected on the nucleus surface. The CNSR baseline mission foresees the landing and anchoring of a spacecraft on the comet nucleus surface, and the collection of the following three types of samples by means of a dedicated ”Sample Acquisition System” (SAS): (1) a core sample gathered from surface down to a maximum depth of 3 meters to be cut in 0,5 m. long sections for storage; (2) a volatile material sample, to be gathered at the bottom of the core sample hole; and (3) a surface material sample, gathered from one or more locations on the surface. These samples will have to be placed in a storage canister in the capsule (to be returned on Earth) and preserved therein at a temperature not higher than 160 k. If on board sensing instrumentation identified comet nucleus features not allowing a safe landing, a back-up system based on a ’harpoon” sampler, would be launched from the spacecraft hovering the comet, and recovered via a tether line; degraded sample quality would be accepted in this case (no surface and volatile samples and limited core sampling depth).
Author
Comet Nuclei; Core Sampling; Samples; Comets; Samplers; Surface Properties; Galactic Structure

19980219270 Washington Univ., Dept. of Astronomy, Seattle, WA USA
Temporal changes in the solar system meteoroid complex
Brownlee, D. E., Washington Univ., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 101-106; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Temporal changes of the dust population in the inner planet region of the solar system can in principle be detected by the study of ancient impact crater records and by the study of tracers of interplanetary material in sediments. The evidence for change is poor but existing information on the present state of the zodiacal dust complex can be used to predict temporal variations of dust density in the inner regions of other planetary systems. It is likely that the evolution of dust in the inner regions of planetary systems can be approximated by an initial period of long term decline followed by a period of relative constancy with superimposed short term fluctuations.
Author
Meteoroids; Zodiacal Dust; Planetary Systems; Solar System

19980219271 Franklin and Marshall Coll., Lancaster, PA USA
Terrestrial-temperature dust around main sequence stars
Backman, Dana E., Franklin and Marshall Coll., USA; Exozodiacal Dust Workshop; Apr. 1998, pp. 107-120; In English; Also announced as 19980219264; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper will briefly review the main sequence debris disks discovered by IRAS, including the beta Pic system which is a well-studied example containing some dust at terrestrial planet temperatures. A few more systems with warm dust will then be considered, followed by a brief discussion of the evolutionary status of these systems and their connection to planet formation.
Author
Main Sequence Stars; Planetary Evolution; Interstellar Matter; Space Debris; Dust

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Observational Research on Star and Planetary System Formation ***Final Report***
Simpson, Janet P., Search for Extraterrestrial Intelligence Inst., USA; Jul. 10, 1998; 102p; In English
Contract(s)/Grant(s): NCC2-551; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Institute scientists collaborate with a number of NASA Ames scientists on observational studies of star and planetary system formation to their mutual benefit. As part of this collaboration, SETI scientists have, from 1988 to the present: (1) contributed to the technical studies at NASA Ames of the Stratospheric Observatory for Infrared Astronomy (SOFIA), an infrared 2.5 meter telescope in a Boeing 747, which will replace the Kuiper Airborne Observatory (KAO), a 0.9 meter telescope in a Lockheed C-141. SOFIA will be an important facility for the future exploration of the formation of stars and planetary systems, and the origins of life, and as such will be an important future facility to SETI scientists; (2) worked with the Laboratory Astrophysics Group at Ames, carrying out laboratory studies of the spectroscopic properties of ices and pre-biotic organics, which could be formed in the interstellar or interplanetary media; (3) helped develop a photometric approach for determining the Frequency of Earth-Sized Inner Planets (FRESIP) around solar-like stars, a project (now called Kepler) which complements the current efforts of the SETI Institute to find evidence for extraterrestrial intelligence; and (4) carried out independent observational research, in particular research on the formation of stars and planetary systems using both ground-based telescopes as well as the KAO.
Derived from text
Research; Observation; Spectroscopy; Planetary Systems; Planetary Evolution; Infrared Telescopes; Extraterrestrial Intelligence; Biological Evolution

19980221274 NASA Ames Research Center, Moffett Field, CA USA
Modeling of the Dust and Gas Outflows from OH 26.5+0.6: The Superwind
Justtanont, K., NASA Ames Research Center, USA; Skinner, C. J., Space Telescope Science Inst., USA; Tielens, A. G. G. M., NASA Ames Research Center, USA; Meixner, M., Illinois Univ., USA; Baas, F., Leiden Univ., Netherlands; Astrophysical Journal; Jan. 01, 1996; ISSN 0004-637X; Volume 456, pp. 337-349; In English
Contract(s)/Grant(s): W-7405-eng-48; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We have observed the extreme OH/IR star, OH 26.5+0.6, in the infrared dust continuum and in the sub- millimeter rotational lines of CO. Mid-infrared images reveal the compact nature of the circumstellar shell (less than 0.5 sec). A deep 9.7 microns absorption feature and an absorption at 18 microns show that the dust mass-loss rate is very high. However, the low antenna temperatures of CO J = 1-0 and 2-1 lines suggest that the outer part of the circumstellar shell is much more tenuous. In order to resolve this discrepancy, we have observed the J = 3-2 and 4-3 CO rotational transitions. We have developed a model for the circumstellar shell for OH 26.5 + 0.6 which is consistent with the infrared and submillimeter observations. The dust and gas data are well fitted by a two-shell model, consisting of a dense shell surrounded by a more tenuous shell. The former we identify with the superwind (M = 5.5 x 10(exp -4) solar mass/ yr), and the latter we identify with mass loss on the asymptotic giant branch (AGB) (M = 10(exp -6) solar mass/ yr). The transition between the two mass-loss phases is shown to be rather abrupt ((Delta)t less than 150 yr). Depending on the mass of the progenitor, this superwind phase may be the last thermal pulse (for M(sub *) less than 1.5 solar mass), or the first of a series of the superwind phases (for up to 8 solar mass), punctuated by a period of low mass-loss rates, before the star evolves off the AGB.
Author
Dust; Models; Observation; Submillimeter Waves; Infrared Radiation; Asymptotic Giant Branch Stars

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LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19980218965 NASA Ames Research Center, Moffett Field, CA USA
Analysis of Returned Comet Nucleus Samples
Chang, Sherwood, Compiler, NASA Ames Research Center, USA; Dec. 1997; 530p; In English, 16-18 Jan. 1989, Milpitas, CA, USA; Also announced as 19980218966 through 19980218996
Contract(s)/Grant(s): RTOP 185-52-22
Report No.(s): NASA/CP-1997-10152; A-950093; NAS 1.55:10152; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

This volume contains abstracts that have been accepted by the Program Committee for presentation at the Workshop on Analysis of Returned Comet Nucleus Samples, held in Milpitas, California, January 16-18, 1989. Conveners are Sherwood Chang (NASA Ames Research Center) and Larry Nyquist (NASA Johnson Space Center). Program Committee members are Thomas Ahrens (ex-officio; California Institute of Technology), Lou Allamandola (NASA Ames Research Center), David Blake (NASA Ames Research Center), Donald Brownlee (University of Washington, Seattle), Theodore E. Bunch (NASA Ames Research Cen-

ter), Humberto Campins (Planetary Science Institute), Jeff Cuzzi (NASA Ames Research Center), Eberhard Griin (Max-Plank-Institut fiir Kemphysik), Martha Hanner (Jet Propulsion Laboratory), Alan Harris (Jet Propulsion Laboratory), John Kerrid-e (University of Califomia, Los Angeles), Yves Langevin (University of Paris), Gerhard Schwehm (ESTEC), and Paul Weissman (Jet Propulsion Laboratory). Logistics and administrative support for the workshop were provided by the Lunar and Planetary Institute Projects Office.
Author
Comet Nuclei; Comets; Samples; Chemical Analysis

19980218992 NASA Johnson Space Center, Houston, TX USA
Description and Analysis of Core Samples: The Lunar Experience
McKay, David S., NASA Johnson Space Center, USA; Allton, Judith H., Lockheed Engineering and Sciences Co., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 433-453; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Although no samples yet have been returned from a comet, extensive experience from sampling another solar system body, the Moon, does exist. While, in overall structure, composition, and physical properties the Moon bears little resemblance to what is expected for a comet, sampling the Moon has provided some basic lessons in how to do things which may be equally applicable to cometary samples. In particular, an extensive series of core samples has been taken on the Moon, and coring is the best way to sample a comet in three dimensions. Data from cores taken at 24 Apollo collection stations and 3 Luna sites have been used to provide insight into the evolution of the lunar regolith. It is now well understood that this regolith is very complex and reflects gardening (stirring of grains by micrometeorites), erosion (from impacts and solar wind sputtering), maturation (exposure on the bare lunar surface to solar winds ions and micrometeorite impacts) and comminution of coarse grains into finer grains, blanket deposition of coarse-grained layers, and other processes. All of these processes have been documented in cores. While a cometary regolith should not be expected to parallel in detail the lunar regolith, it is possible that the upper part of a cometary regolith may include textural, mineralogical, and chemical features which reflect the original accretion of the comet, including a form of gardening. Differences in relative velocities and gravitational attraction no doubt made this accretionary gardening qualitatively much different than the lunar version. Furthermore, at least some comets, depending on their orbits, have been subjected to impacts of the uppermost surface by small projectiles at some time in their history. Consequently, a more recent post-accretional gardening may have occurred. Finally, for comets which approach the sun, large scale erosion may have occurred driven by gas loss. The uppermost material of these comets may reflect some of the features of this erosional process, such as crust formation, and variations with depth might be expected. Overall, the upper few meters of a comet may be as complex in their own way as the upper few meters of the lunar regolith have proven to be, and by analogy, detailed studies of core samples containing this depth information will be needed to understand these processes and the details of the accretional history and the subsequent alteration history of comets.
Author
Core Sampling; Comets; Moon; Galactic Structure; Surface Properties; Samples; Lunar Surface; Regolith

19980218993 NASA Ames Research Center, Moffett Field, CA USA
The Origin, Composition and History of Comets from Spectroscopic Studies
Allamandola, L. J., NASA Ames Research Center, USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 455-472; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

A wealth of information essential to understanding the composition and physical structure of cometary ice and hence gain deep insight into the comet's origin and history, can be gleaned by carrying out a full range of spectroscopic studies on the returned sample. These studies ought to be among the first performed as they are generally non-destructive and will provide a broad data bank which will be crucial in planning subsequent analysis. Examples of the spectroscopic techniques along with relative sensitivities and transitions probed, are discussed. Different kind of "spectroscopy" is summarized, with emphasis placed on the kind of information each provides. Infrared spectroscopy should be the premier method of analysis as the mid-IR absorption spectrum of a substance contains more global information about the identity and structure of that material than any other property. In fact, the greatest strides in our understanding of the composition of interstellar ices (thought by many to be the primordial material from which comets have formed) have been taken during the past ten years or so because this was when high quality infrared spectra of the interstellar medium (ISM) first became available. The interpretation of the infrared spectra of mixtures, such as expected in comets, is often (not always) ambiguous. Consequently, a full range of other non-destructive, complementary spectroscopic measurements are required to fully characterize the material, to probe for substances for which the IR is not well suited and to lay the groundwork for future analysis. Given the likelihood that the icy component (including some of the organic and mineral phases) of the returned sample will be exceedingly complex, these techniques must be intensely developed over the next decade

and then made ready to apply flawlessly to what will certainly be one of the most precious, and most challenging, samples ever analyzed.
Author
Comets; Composition (Property); Interstellar Matter; Ice; Physical Properties; Spectroscopic Analysis; Samples; Spectroscopy

19980218994 Cassino Univ., Italy
Laboratory Analyses of Micron-Sized Solid Grains: Experimental Techniques and Recent Results
Colangeli, L., Cassino Univ., Italy; Bussoletti, E., Istituto Universitario Navale, Italy; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 473-489; In English; Also announced as 19980218965
Contract(s)/Grant(s): MPI-120111; CNR-8800361-02; CNR-PSN-88-020; ASI-88-060; Avail: CASI; A03, Hardcopy; A04, Microfiche

The investigation of comets has proceded for long time on remote observations from ground. In 1986 several space missions towards comet Halley have allowed, for the first time, to have a close look to a comet (Encounters with comet Halley 1986). In particular, the GIOTTO mission by the European Space Agency (ESA) has provided ”in situ” observations and measurements up to a distance of about 600 Km from the nucleus. Surface morphology and physical properties have been observed; plasma, gas and dust components in the coma have been analyzed. It is clear, however, that definite answers about the primordial nature of comets and their relation with interstellar material can be obtained only from direct analysis of cometary samples. Future space missions such as CRAF (NASA) and ROSETTA (ESA) have exactly this aim. In particular, the ambitious goal of Rosetta mission is to return to earth comet samples which can be analyzed carefully in laboratory. In preparation to this event a large effort must be placed both in the improvement of existing analytical techniques and in the development of new methods which will provide as much information as possible on ”returned comet samples” (hereinafter RCSS). Handling of extra-terrestrial samples will require to operate in carefully controlled and extremely ”inert” ambient conditions. In addition, working on a limited amount of ”unique” cometary material will also impose to use analytical techniques which should not produce alteration, contamination or destruction of the sample. Many suggestions can come from people working in laboratory on ”cosmic dust”; in fact, experimental methods which are applied to analyze: (a) interplanetary dust particles (IDPS) collected in stratosphere, (b) meteorites, and (c) laboratory produced cosmic dust analog samples, can be mutuated or properly improved in the future for specific application to RCSS. Since modern techniques used to analyze IDPs and meteorites are reviewed elsewhere in this workshop, we will discuss some of the most powerful techniques which are presently applied to characterize physical and chemical properties of micron and/or submicron solid grains, synthetized in laboratory with the aim of simulating cosmic dust.
Author
Chemical Properties; Comets; Cosmic Dust; Morphology; Surface Properties; Simulation; Physical Properties

19980218995 Kernforschungsanlage, Inst. fuer Chemie 1, Juelich, Germany
Handling and Analysis of Ices in Cryostats and Glove Boxes in View of Cometary Samples
Roessler, K., Kernforschungsanlage, Germany; Hsiung, P., Kernforschungsanlage, Germany; Heyl, M., Kernforschungsanlage, Germany; Neukum, G., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Oehler, A., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Kochan, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 491-503; In English; Also announced as 19980218965; Avail: CASI; A03, Hardcopy; A04, Microfiche

The preparation and analysis of frozen volatiles at temperatures less than or equal to 77 K via condensation and optical spectroscopy, resp., is traditionally performed in cryostats in situ. The study of larger ice samples, in particular to simulate processes in icy material of the solar system such as comets necessitated a somewhat different approach, cf. Preparation, the proper study in a cooled sample holder, and analysis of the states before and after the experiment have often to be performed at different sites, thus, necessitating cryotransport and handling of the samples under protective conditions, i.e. inert and cold atmosphere or vacuum. This became even more stringent for the comet simulation experiments performed since 1987 by a team of scientists from different disciplines in the Big Space Simulator in the German Aerospace Research Establishment DLR-Koln. Three experiments have been performed with water ice and water- CO2-ice mineral dust mixtures in April 1987 (KOSI-I), April 1988 (KOSI-II), and November 1988 (KOSI-III). A fourth experiment is prepared for May 1989 (KOSI-IV). These experiments deal with icy material of approx. 10 l volume and 4 to 5 kg weight, each for a standard and the proper sample to be irradiated several ten hours with an artificial sun of approx. 1-3 SC. Techniques applied for cryohandling, -transport, -storage and -analysis will be reported here. They may be considered as first tentative steps in view of the development of methods for treatment of icy samples from space brought to earth via return missions such as ROSETTA.
Author
Comets; Samples; Chemical Analysis; Handling Equipment; Ice; Physical Properties; Spectroscopic Analysis; Experimentation

19980218996 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Electron Spin Resonance (ESR) Studies of Returned Comet Nucleus Samples

Tsay, Fun–Dow, Jet Propulsion Lab., California Inst. of Tech., USA; Kim, Soon Sam, Jet Propulsion Lab., California Inst. of Tech., USA; Liang, Ranty H., Jet Propulsion Lab., California Inst. of Tech., USA; Analysis of Returned Comet Nucleus Samples; Dec. 1997, pp. 505-514; In English; Also announced as 19980218965; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Electron Spin Resonance (ESR) studies have been carried out on organic and inorganic free radicals generated by gamma-ray and/or UV-irradiation and trapped in ice matrices. It is suggested that the concentration of these free radicals together with their thermal stability can be used as an accurate built-in geothermometer and radiation probe for returned comet nucleus sample studies. ESR studies have also been carried out on paramagnetic (Mn(2+), Ti(3+), and Fe(3+)) and ferromagnetic (ferric oxide and metallic iron) centers known to be present in terrestrial and extraterrestrial samples. The presence or absence of these magnetic centers coupled with their characteristic ESR lineshape can be used to investigate the shock effects, quenching/cooling rate and oxidation-reduction conditions in the formation and subsequent evolution of returned comet nucleus samples.

Author

Free Radicals; Comet Nuclei; Electron Paramagnetic Resonance; Ice; Samples; Irradiation; Thermal Radiation; Organic Compounds; Inorganic Compounds; Comets; Silicates

19980219034 Clark-Atlanta Univ., GA USA

Cross Sections for Electron Impact Excitation of Ions Relevant to Planetary Atmospheres Observation ***Final Report, 1 Apr. 1995 - 30 Jun. 1998***

Tayal, Swaraj S., Clark-Atlanta Univ., USA; 1998; 4p; In English

Contract(s)/Grant(s): NAG5-4763; NAGw-4447; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this research grant was to calculate accurate oscillator strengths and electron collisional excitation strengths for inelastic transitions in atomic species of relevance to Planetary Atmospheres. Large scale configuration-interaction atomic structure calculations have been performed to obtain oscillator strengths and transition probabilities for transitions among the fine-structure levels and R-matrix method has been used in the calculations of electron-ion collision cross sections of C II, S I, S II, S III, and Ar II. A number of strong features due to ions of sulfur have been detected in the spectra of Jupiter satellite Io. The electron excitation cross sections for the C II and S II transitions are studied in collaboration with the experimental atomic physics group at the Jet Propulsion Laboratory. There is excellent agreement between experiment and theory which provide an accurate and broad-base test of the ability of theoretical methods used in the calculation of atomic processes. Specifically, research problems have been investigated for: electron impact excitation cross sections of C II: electron impact excitation cross sections of S III; energy levels and oscillator strengths for transitions in S III; collision strengths for electron collisional excitation of S II; electron impact excitation of inelastic transitions in Ar II; oscillator strengths of fine-structure transitions in neutral sulfur; cross sections for inelastic scattering of electrons from atomic nitrogen; and excitation of atomic ions by electron impact.

Derived from text

Scattering Cross Sections; Electron Impact; Excitation; Ions; Planetary Atmospheres; Computation; Oscillator Strengths

19980219170 NASA Langley Research Center, Hampton, VA USA

Numerical Roll Reversal Predictor-Corrector Aerocapture and Precision Landing Guidance Algorithms for the Mars Surveyor Program 2001 Missions

Powell, Richard W., NASA Langley Research Center, USA; 1998; 11p; In English; Atmospheric Flight Mechanics Conference, 10-12 Aug. 1998, Boston, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 98-4574; No Copyright; Avail: Issuing Activity (American Inst. of Aeroanutics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA), Hardcopy, Microfiche

This paper describes the development and evaluation of a numerical roll reversal predictor-corrector guidance algorithm for the atmospheric flight portion of the Mars Surveyor Program 2001 Orbiter and Lander missions. The Lander mission utilizes direct entry and has a demanding requirement to deploy its parachute within 10 km of the target deployment point. The Orbiter mission utilizes aerocapture to achieve a precise captured orbit with a single atmospheric pass. Detailed descriptions of these predictor-corrector algorithms are given. Also, results of three and six degree-of-freedom Monte Carlo simulations which include navigation, aerodynamics, mass properties and atmospheric density uncertainties are presented.

Author

Algorithms; Predictor-Corrector Methods; Numerical Analysis; Deployment; Aircraft Landing; Aerocapture

19980219315 NASA Ames Research Center, Moffett Field, CA USA

An Intercomparison of the Dynamical Cores of Global Atmospheric Circulation Models for Mars ***Final Report, 26 Feb. 1996 - 25 Feb. 1998***

Hollingsworth, Jeffery L., NASA Ames Research Center, USA; Bridger, Alison F. C., San Jose State Univ., USA; Haberle, Robert M., NASA Ames Research Center, USA; 1998; 10p; In English

Contract(s)/Grant(s): NCC2-5171; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is a Final Report for a Joint Research Interchange (JRI) between NASA Ames Research Center and San Jose State University, Department of Meteorology. The focus of this JRI has been to evaluate the dynamical ”cores” of two global atmospheric circulation models for Mars that are in operation at the NASA Ames Research Center. The two global circulation models in use are fundamentally different: one uses spherical harmonics in its horizontal representation of field variables; the other uses finite differences on a uniform longitude-latitude grid. Several simulations have been conducted to assess how the dynamical processors of each of these circulation models perform using identical ”simple physics” parameterizations. A variety of climate statistics (e.g., time-mean flows and eddy fields) have been compared for realistic solstitial mean basic states. Results of this research have demonstrated that the two Mars circulation models with completely different spatial representations and discretizations produce rather similar circulation statistics for first-order meteorological fields, suggestive of a tendency for convergence of numerical solutions. Second and higher-order fields can, however, vary significantly between the two models.

Author

Atmospheric Circulation; Atmospheric Models; Mars (Planet); Evaluation; Cores; Numerical Analysis; Dynamic Characteristics

19980219469 NASA Langley Research Center, Hampton, VA USA

An Atmospheric Guidance Algorithm Testbed for the Mars Surveyor Program 2001 Orbiter and Lander

Striepe, Scott A., NASA Langley Research Center, USA; Queen, Eric M., NASA Langley Research Center, USA; Powell, Richard W., NASA Langley Research Center, USA; Braun, Robert D., NASA Langley Research Center, USA; Cheatwood, F. McNeil, NASA Langley Research Center, USA; Aguirre, John T., NYMA, Inc., USA; Sachi, Laura A., Lockheed Martin Corp., USA; Lyons, Daniel T., Jet Propulsion Lab., California Inst. of Tech., USA; 1998; 13p; In English; Atmospheric Flight Mechanics Conference, 10-12 Aug. 1998, Boston, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 98-4569; No Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA), Hardcopy, Microfiche

An Atmospheric Flight Team was formed by the Mars Surveyor Program ’01 mission office to develop aerocapture and precision landing testbed simulations and candidate guidance algorithms. Three- and six-degree of-freedom Mars atmospheric flight simulations have been developed for testing, evaluation, and analysis of candidate guidance algorithms for the Mars Surveyor Program 2001 Orbiter and Lander. These simulations are built around the Program to Optimize Simulated Trajectories. Subroutines were supplied by Atmospheric Flight Team members for modeling the Mars atmosphere, spacecraft control system, aeroshell aerodynamic characteristics, and other Mars 2001 mission specific models. This paper describes these models and their perturbations applied during Monte Carlo analyses to develop, test, and characterize candidate guidance algorithms.

Author

Spacecraft Control; Flight Simulation; Controlled Atmospheres; Algorithms; Aerocapture; Landing Instruments

19980221271 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Lunar Crust: Global Structure and Signature of Major Basins

Neumann, Gregory A., Johns Hopkins Univ., USA; Zuber, Maria T., Johns Hopkins Univ., USA; Smith, David E., NASA Goddard Space Flight Center, USA; Lemoine, Frank G., NASA Goddard Space Flight Center, USA; Journal of Geophysical Research; Jul. 25, 1996; ISSN 0148-0227; Volume 101, No. E7, pp. 16,841-16,863; In English; Original contains color illustrations

Contract(s)/Grant(s): NAGw-4971

Report No.(s): Paper 96JE01246; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

New lunar gravity and topography data from the Clementine Mission provide a global Bouguer anomaly map corrected for the gravitational attraction of mare fill in mascon basins. Most of the gravity signal remaining after corrections for the attraction of topography and mare fill can be attributed to variations in depth to the lunar Moho and therefore crustal thickness. The large range of global crustal thickness (approx. 20-120 km) is indicative of major spatial variations in melting of the lunar exterior and/or significant impact-related redistribution. The 6l-km average crustal thickness, constrained by a depth-to-Moho measured during the Apollo 12 and 14 missions, is preferentially distributed toward the farside, accounting for much of the offset in center-of-figure from the center-of-mass. While the average farside thickness is 12 km greater than the nearside, the distribution is nonuniform, with dramatic thinning beneath the farside, South Pole-Aitken basin. With the global crustal thickness map as a constraint, regional

inversions of gravity and topography resolve the crustal structure of major mascon basins to half wavelengths of 150 km. In order to yield crustal thickness maps with the maximum horizontal resolution permitted by the data, the downward continuation of the Bouguer gravity is stabilized by a three- dimensional, minimum-slope and curvature algorithm. Both mare and non-mare basins are characterized by a central upwarped moho that is surrounded by rings of thickened crust lying mainly within the basin rims. The inferred relief at this density interface suggests a deep structural component to the surficial features of multiring lunar impact basins. For large (greater than 300 km diameter) basins, moho relief appears uncorrelated with diameter, but is negatively correlated with basin age. In several cases, it appears that the multiring structures were out of isostatic equilibrium prior to mare emplacement, suggesting that the lithosphere was strong enough to maintain their state of stress to the present.
Author
Lunar Crust; Structural Basins; Data Acquisition; Algorithms; Anomalies; Lunar Gravitation

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SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19980219468 NASA Marshall Space Flight Center, Huntsville, AL USA
Bright Points and Subflares in UV Lines and in X-Rays
Rovira, M., Instituto de Astronomia y Fisica del Espacio, Argentina; Schmieder, B., Observatoire de Paris-Meudon, France; Demoulin, P., Observatoire de Paris-Meudon, France; Simnett, G. M., Birmingham Univ., UK; Hagyard, M. J., NASA Marshall Space Flight Center, USA; Reichmann, E., NASA Marshall Space Flight Center, USA; Tandberg–Hanssen, E., NASA Marshall Space Flight Center, USA; 1998; 21p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have analysed an active region which was observed in Halpha (MSDP), UV lines (SMM/UVSP), and in X rays (SMM/HXIS). In this active region there were only a few subflares and many small bright points visible in UV and in X rays. Using an extrapolation based on the Fourier transform we have computed magnetic field lines connecting different photospheric magnetic polarities from ground-based magnetograms. Along the magnetic inversion lines we find 2 different zones: 1. a high shear region (less than 70 degrees) where subflares occur 2. a low shear region along the magnetic inversion line where UV bright points are observed.
Author
Ultraviolet Spectrometers; Magnetic Field Inversions; Magnetic Signatures; Photosphere; X Rays

19980220115 Sonoma State Univ., Dept. of Physics and Astronomy, Rohnert Park, CA USA
Magnetospheric Accretion in PSR 1259-63 ***Final Report, 1 Dec. 1996 - 25 May 1998***
Cominsky, Lynn R., Sonoma State Univ., USA; May 25, 1998; 24p; In English
Contract(s)/Grant(s): NAG5-2948; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We report the results from X-ray and hard X-ray observations of the PSR B1259-63/SS 2883 system with the ASCA and the CGRO satellites, performed between 1995 February and 1996 January when the pulsar was near apastron. The system was clearly detected in each of the two ASCA observations with luminosity in the 1-10 keV band of L(sub X) = (9 +/- 3) x 10(exp 32) (d/2 kpc) erg/ s, while OSSE did not detect significant hard X-rays from the system. X-ray spectra obtained with ASCA show a single power-law spectrum with a photon index of 1.6 +/- 0.3. No pulsations were detected in either the ASCA nor the OSSE data. Combined with previous results from X-ray and hard X-ray observations, we obtained binary modulation in X-ray luminosity and photon index of high energy emission from the system for the entire orbit. The results are in agreement with predictions based on synchrotron emission model from relativistic particles in a shocked pulsar wind interacting with the gaseous outflow from the Be star.
Author
X Rays; Observation; Luminosity; B Stars; X Ray Spectra; Pulsar Magnetospheres

19980218948 Osaka City Univ., Faculty of Engineering, Japan

Memoirs of the Faculty of Engineering, Volume 38

Morimoto, Tokio, Editor, Osaka City Univ., Japan; Yamada, Shoichiro, Editor, Osaka City Univ., Japan; Yamada, Bunichiro, Editor, Osaka City Univ., Japan; Saka, Toshitsugu, Editor, Osaka City Univ., Japan; Kobayashi, Harutoshi, Editor, Osaka City Univ., Japan; Kitada, Tadayoshi, Editor, Osaka City Univ., Japan; Kitamura, Yasuhiko, Editor, Osaka City Univ., Japan; Yamauchi, Kiyoshi, Editor, Osaka City Univ., Japan; Dec. 1997; ISSN 0078-6659; 272p; In English; Also announced as 19980218949 through 19980218964; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

This current journal, Volume 38, includes the following topics: Improvement of Damping Property of CFRP Composite Beam Interleaved with Shape Memory Polymer Using CFRP Laminate as a Heater; Extracting Three-dimensional Information with Complex Amplitude-Pattern Matching using a Holographic Method; A Comparative Study of Neural Network Approach and Linear Regression for Analysis of Multivariate Data of the Defect Color on the Color CRT Displays; Polymerization of Alkyl Methacrylates with V(acaC)3-AIEt3 Catalyst; Tangent Stiffness Equations for Laterally Distributed Loaded Member; Single- and Double-Photoionization of Sulfur Dioxide; Application of a Cooled CCD for Amateur Astronomers to Alignment of an Imaging Polychromator; Estimating the Motion Parameters of a Moving Camera from Perspective Image Sequences; Multicolor-Pattern Light Projection for 3D Image Matching; The 3-D Box Method for Recovering Shapes of 3-D Objects from Multi-Images; An Accurate Method for Finding the Control Points of Bezier Curves; Learning Efficiency and Temperature Coefficient of Forward Type Three Layer Neural Networks; and Catalytic Effects of Aminated-B-Cyclodextrin Derivatives for the Decarboxylation of Oxalacetate.

Author

Structural Analysis; Structural Members; Imaging Techniques; Neural Nets; Chemical Reactions; Display Devices

Subject Term Index

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